# Management of dental trauma among children in Tanzania

FEBRONIA KOKULENGYA KAHABUKA

# MANAGEMENT OF DENTAL TRAUMA AMONG CHILDREN IN TANZANIA

# Management of dental trauma among children in Tanzania

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For my children Gloria Nitwele, Gellane Kaihura and Genovive Shubira

## List of publications included in this thesis

1 Prevalence of teeth showing untreated dental trauma among nursery and primary school pupils in Dar es Salaam, Tanzania. Kahabuka FK, van t Hof M, Plasschaert A. Dental Traumatology, accepted.

2 Oro-dental injuries and their management among children and adolescents in Tanzania. Kahabuka FK, Willemsen W, van t Hof M, Ntabaye MK, Plasschaert A, Frankenmolen F, Burgersdijk R. East African Medical Journal 1999,76:160-2.

3 Initial treatment of traumatic dental injuries by dental practitioners. Kahabuka FK, Willemsen W, van t Hof M, Ntabaye MK, Burgersdijk R, Frankenmolen F, Plasschaert A. Endod Dent Traumatol 1998;14:206-9.

4 Testing a consensus conference method in Africa by discussing the management of traumatic dental injuries in Tanzania. Kahabuka FK, Ntabaye MK, van t Hof M, Plasschaert A. East African Medical Journal, 2000;77:552-7.

5 The effect of a consensus statement on initial treatment choice for traumatic dental injuries. Kahabuka FK, Ntabaye MK, van t Hof M, Plasschaert A. Dental Traumatology, submitted.

6 Influence of seminar and mailed guidelines on schoolteachers knowledge on emergency treatment for oro-dental injuries. Kahabuka FK, van 't Hof M, Willemsen W, Burgersdijk R. East African Medical Journal, submitted.

7 The effect of a single educational input given to school teachers on patient s correct handling after dental trauma. Kahabuka FK, Willemsen, van 't Hof M, Burgersdijk R. South African Dental Journal, accepted.

8 Grading the management options for traumatic dental injuries Kahabuka FK, W. Willemsen. Journal of Public Health Dentistry, submitted.

# Contents

# Chapter 1

## General Introduction

### 1.1 Preamble

Traumatic dental injuries are common especially in children, affecting both the deciduous and permanent dentition. Most of these injuries occur as a result of children s activities and so long as the children remain active, these injuries will continue as a frequent dental problem that requires dedicated care (1). Usually, trauma to the teeth and surrounding structures cause pain to the injured child and is accompanied with anxiety both to the child as well as to the teachers or parents. Furthermore, dental trauma constitutes a true emergency to the child and parents or teachers on the one hand and to the dental personnel on the other hand. Dental trauma patients come to dental clinics, without appointment and sometimes in the midst of a very busy schedule.

For anticipation of successful treatment of dental injuries, all patients who sustain dental trauma should seek dental consultation as soon as possible after injury. More specifically, tooth avulsion of permanent dentition should be treated immediately after injury. That is, the immediate care of traumatized teeth depends on the actions taken by the lay community. It also depends on knowledge and skills of the dentist who will treat the patient. Thus, the dentists need to have correct knowledge on the treatment of dental trauma while the lay community is expected to seek dental consultation immediately after injury and to handle the avulsed tooth correctly as well as to transport the avulsed tooth in one of the recommended transport media. Unfortunately, dentists who provide primary care were reported by Hamilton et al (2) to have insufficient knowledge to treat dental trauma. Likewise, the lay community has been reported (3-4) to have insufficient information on dental trauma. Therefore it is important to provide the required knowledge and skills to treat dental trauma to the dentists and to provide the information to the lay community on actions to be taken after injury.

### 1.2 Background

Published findings on dental trauma reveal that the prevalence of dental trauma range from 3-50% depending on the study design, area of study (hospital setting, private practice at schools or sports ground), age and gender of the populations examined (5-10). In the young age group, a peak of traumatic dental injuries is observed at 2-4 years, while in the older age group, the peak is observed at 8-12 years (7,10-11). Boys suffer dental trauma almost twice as much as girls (5-

6,8,10-11) and the major cause is falls during play and sports accidents followed by violence or fights (5,8,12). Other causes include, being struck by an object, traffic accidents, and collision with another child (8,12,). About 50% of the injuries in primary dentition are concussion (7,10) while nearly the same percentage in the permanent dentition is fracture of tooth crown (5-6,10,13). Luxation and bone injuries are prevalent in studies done within hospital environment (14-15); whereas, tooth fractures are prominent in organised groups (16). Most dental accidents occur inside or outside the homes and at schools (6). Other places of injury are on road, at playgrounds or swimming pools (6,17). The most frequently affected teeth are the maxillary central incisors followed by maxillary lateral incisors (5,7-11). There is a seasonal variation in the prevalence of dental trauma depending on the activities which children engage in during the respective seasons (9-10,18). Most patients seek dental consultation between 1-7 days after injury (5-6,15). Increased overjet and insufficient lip coverage are significant predisposing factors (12,19). Late complications of dental injuries are mainly pulp canal obliteration, pulp necrosis, root resorption and loss of marginal alveolar bone (20). Other complications are ectopic tooth eruption, effect on permanent successors such as disturbances in mineralization and root development (21-23). The proposed preventive measures include, use of mouthprotectors, mandatory use of orofacial protectors during some organised sports, integral use of motorcycle helmets by drivers and passengers, car seat belts and special car seats for small children. Other measures include, careful monitoring of occlusal development, timely orthodontic intervention, advocating to the lay community of education in the prevention and immediate treatment of dental injuries (16,24,).

### 1.3 Relevance of the study

The dental disease pattern has changed in industrialized countries where a marked decline in the prevalence of dental caries has been observed (25-26). As such, Andreasen (27) cautioned that dental trauma within the foreseeable future will probably exceed dental caries and periodontal diseases as the most significant threat to dental health among the youth and will be accompanied by significant economic consequences. In a developing country like Tanzania, the prevalence of dental caries is low, the treatment alternatives are scarce and there are few trained dentists. In addition, public health problems differ from those in Western countries. For instance, while cancer is a public health problem in Western countries, malaria, waterborne diseases, infectious diseases and of late AIDS are widespread problems. Consequently, dental diseases receive little attention from authorities and the community at large. As a result, several dental

problems like dental trauma have not been addressed and thus there was a need to dedicate sometime to work on this area.

## 1.4 Objectives of the study

The general objectives of the study were to gain insight in the occurrence of dental trauma in Tanzania, to explore the current management of these traumas and to plan and implement intervention measures accordingly. The specific objectives were;

1.4.1 To investigate the prevalence of various types of dental trauma among nursery and primary school children

1.4.2 To investigate the treatment provided to dental trauma among children aged 1-17 years.

1.4.3 To develop guidelines on treatment modalities for traumatic dental injuries in Tanzania: consensus statement.

1.4.4 To distribute the consensus statement to dental practitioners and evaluate the effect of the statement on the dental practitioners' treatment choices.

1.4.5 To provide guidelines to school teachers (on behalf of parents and the community), narrating the steps to be taken when a child sustains an oral injury and thereafter,

1.4.5.1 To evaluate the influence of the guidelines on school teachers knowledge about self-care following dental trauma.

1.4.5.2 To evaluate the influence of the guidelines on the actions taken by children in an event of dental trauma.

## 1.5 Outline of the thesis

The first study (chapter 2) describes the prevalence of untreated dental trauma among nursery and primary school pupils in Tanzania, thus portraying the background situation of dental trauma among Tanzanian children. The following two chapters (3 and 4 respectively) outline the initial treatment of traumatic dental injuries provided by dental practitioners in the country and those provided at a University teaching hospital. Chapter 5 summarizes the implementation of a consensus conference that was conducted (in response to the treatments reported in the previous two chapters) to propose feasible treatments for dental trauma in Tanzania. The consensus conference was followed by distribution of the consensus statement to all dental practitioners in Tanzania. Therefore, chapter 6 elaborates on the influence of the consensus statement on dental practitioners' choice of initial treatment for traumatic dental injuries. Another measure that was employed in this study as an attempt to promote the

management of dental trauma was preparation and distribution of guidelines to schoolteachers on steps to be taken by the lay community when a child sustains a dental trauma. Thus, the influence of those guidelines on schoolteachers knowledge about self-care following trauma is described in chapter 7 whereas in chapter 8 the effect of the guidelines on the correct handling after dental trauma is presented. An overall discussion, implications and advantages of the study are presented in chapter 9.

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# Chapter 2

## Prevalence of teeth with untreated dental trauma among nursery and primary schoolpupils in Dar es Salaam, Tanzania

Kahabuka FK, Plasschaert A, van t Hof MA.

Dental Traumatology, accepted

### Abstract

The aim of this study was to investigate the prevalence of teeth with untreated dental trauma among children aged 4-15 years in Dar es Salaam, Tanzania. A sample of 4524 children from three districts of different socio-economic status in the Dar es Salaam area was examined for signs of dental trauma in 1998/99. In 21% of all children examined, at least one type of untreated dental trauma was observed. A high percentage of untreated dental trauma was observed at the ages of 4 and 15 years. The most frequently observed type of dental trauma was enamel fracture (67%) followed by enamel-dentin fracture (26%). A significant gender influence on the occurrence of untreated dental trauma was observed, with more boys (23%) having untreated dental trauma than girls (19%). A higher percentage of untreated dental trauma was observed among children in the district with highest SES (26%) compared to the prevalence in the other two districts (14-17%). The findings of this study show that dental traumas are prevalent among Tanzanian children. Therefore, provision of information to the lay community about the importance of early management of dental trauma, ways of preventing trauma and appropriate handling of avulsed teeth is essential in order to minimize the rate of dental injuries and the related complications.

### Introduction

Substantial information about dental trauma is available (1), which reveals that patients who have suffered trauma without symptoms or obvious complications do not consult dental clinics and are therefore seen at routine appointments. Furthermore, it is known that accidents during play and sports are the major causes of oro-dental trauma. It is also known that the most common type of injury are small crown fractures, the most frequently affected teeth are the maxillary incisors and boys suffer dental trauma almost twice as much as girls. Increased overjet and insufficient lip coverage are reported as significant

predisposing factors. Late complications of dental injuries are mainly pulp necrosis, pulp canal obliteration, root resorption and loss of marginal alveolar bone. Other complications are ectopic tooth eruption, effect on permanent successors such as disturbances in mineralization and root development.

In the early nineties, Andreasen (2) hypothesised that dental trauma in the foreseeable future will probably exceed dental caries and periodontal diseases. Since that hypothesis was made, several studies conducted in different populations report 7-50% of the child population to have sustained an oro-dental injury by the age of 15 years (3-7). This information supports the concept that traumatic dental injuries are widespread among children. Accordingly, several authors (8-13) have recommended educational programs for lay people about the importance of early treatment for dental trauma, ways of preventing these traumas and procedures for appropriate emergency management of avulsed teeth. Such an educational program for the lay public in a country should preferably be preceded by an investigation of background information on the occurrence of oro-dental injuries in the community. The information gathered can be utilized to prepare the contents of a program. The aim of this study therefore, was to investigate the prevalence of teeth with untreated dental trauma among children aged 4-15 years in Dar es Salaam, Tanzania.

## Subjects and Methods

### Subjects

Three districts Kinondoni, Ilala and Temeke with the city centre found in Ilala district, make up the Dar es Salaam region. People living in the three districts can be classified (on average) to belong to high, medium and low socio-economic status (SES) respectively.

A list of government owned primary and nursery schools was obtained from the Dar es Salaam city council while that of private schools was obtained by interviewing 23 residents from the three districts of Dar es Salaam. In 1998, Dar es Salaam comprised about 244000 pupils in the three districts of Kinondoni, Ilala and Temeke with 44%, 30% and 26% of the pupils respectively. It was intended to examine 4000 pupils, hence a random selection of schools was done independently in each district until an approximate number of required pupils was reached. A total of 4524 children were examined; 2378 (52%), 1212 (27%) and 934 (21%) from Kinondoni, Ilala and Temeke districts respectively, showing a reasonably proportional distribution of the children over the districts (Table 1).

Table 1. Distribution of the sample (number of children and mean age, n=4524) by district and gender

| District (SES) / Gender | Kinondoni (high) n | (mean age) | Ilala (medium) n | (mean age) | Temeke (Low) n | (mean age) | Total n | (mean age) |
|---|---|---|---|---|---|---|---|---|
| Boys | 1108 | (9.9) | 544 | (9.8) | 459 | (11.1) | 2111 | (10.2) |
| Girls | 1270 | (9.9) | 668 | (10.1) | 475 | (10.4) | 2413 | (10.1) |
| Total | 2378 | (9.9) | 1212 | (9.9) | 934 | (10.7) | 4524 | (10.1) |

Methods

Children s age, district and gender were abstracted from class attendance registers. One investigator (FKK) carried out the clinical examination, while one trained dentist recorded the results. Only upper and lower anterior teeth were included in the dental examination. Examination was done in a classroom utilising natural daylight reflected through a plane mouth mirror, with children seated on an office chair.

A tooth was scored to have untreated fractured crown if it was observed that part of the tooth crown was broken while there was no sign that dental caries had caused the fracture. Fractured crown was further scored as;

I Enamel fracture when the fracture was confined to enamel

I Enamel-dentin fracture without pulp involvement when a central area (dentin) of a fractured tooth crown clearly exhibited different appearance from the surrounding enamel

III Enamel-dentin fracture with pulp involvement if pulpal tissue was in direct contact with the oral cavity or an empty pulp horn was visible.

A tooth was scored to have had injury to tooth supporting structures affecting the pulp if it was found to have a grey discolouration in comparison to the adjacent teeth but with no sign that dental caries was a cause of the discolouration. Tooth avulsion was scored when an anterior tooth was missing with the adjacent teeth being sound and the child confirmed to have had sustained injury and his/her tooth was knocked out. A tooth was scored to have had sustained intrusion if it was found to be short of the occlusal plane compared to adjacent teeth and the child confirmed to have sustained injury. Some injuries were not included in this study, namely enamel crack, injuries that might have healed such as luxations or root fractures since no x-rays were taken. Intra-examiner variability was checked through duplicate examination of every 10th child (n=490) without reference to previously awarded scores. The intra-examiner agreement was high. For the four point-scale (no trauma, enamel fracture, enamel dentin fracture, grey

discolouration) kappa = 0.81 (95% CI 0.74-0.89) and for the dichotomous scale (no trauma, trauma), kappa = 0.92 (95% CI 0.86-0.98).
Permission to conduct the study was granted by the regional and district educational authorities while parents and children s consent was obtained through the heads of schools.
Data entry was done on EPI-INFO, (EPI 6.04a WHO programme, 1996) and analysed using the SPSS package. Chi-square test and logistic regression were employed to test the differences between the age groups, gender and area of residence (district). P<0.05 was chosen as the level of significance.

## Results

Children in this study group were aged 4-15 years, mean age 10.1 years, those from the district with low SES being older (Table 1). Girls constituted 53% of the examined children, while boys constituted 47%. In 947 (21%) of the 4524 children examined, at least one type of untreated dental trauma was observed. A high percentage of untreated dental trauma was seen at the age of 4 years, the prevalence decreased from age five and rose again at 9 years and was highest at 15 years (Fig 1).

More boys (23%) were found to have untreated dental trauma than girls (19%), p= 0.005 (table 2). Boys had a significantly higher risk on dental trauma compared to girls, (logistic regression, p=0.03), Odds Ratio = 1.18 (95% CI:1.01-1.37). A significantly higher percentage of crown fractures with dentin involvement was observed in boys (33%) as compared to girls, (24%), Chi square test, p<0.0002.

A higher percentage (26%) of untreated dental trauma teeth was observed among children in the district with relatively high socio-economic status (SES) compared to 17% and 14% among children in the other two districts with low and medium SES (table 2). This district effect remained significant after correction for differences in age and gender indicating that children from the highest SES district (Kinondoni) had a higher risk for dental trauma compared to those from Temeke with lower SES, Odds Ratio = 1.88 (95% CI:1.54-2.31) and compared to those from Ilala with medium SES, Odds Ratio = 2.37 (95% CI:1.95-2.88). There was no significant difference in the risk for dental trauma between the two lower SES districts, Odds Ratio = 1.26 (95% CI:0.98-1.61).
Most of the teeth showing untreated dental trauma had sustained enamel fracture (68%) followed by enamel-dentin fracture (26%), table 3.

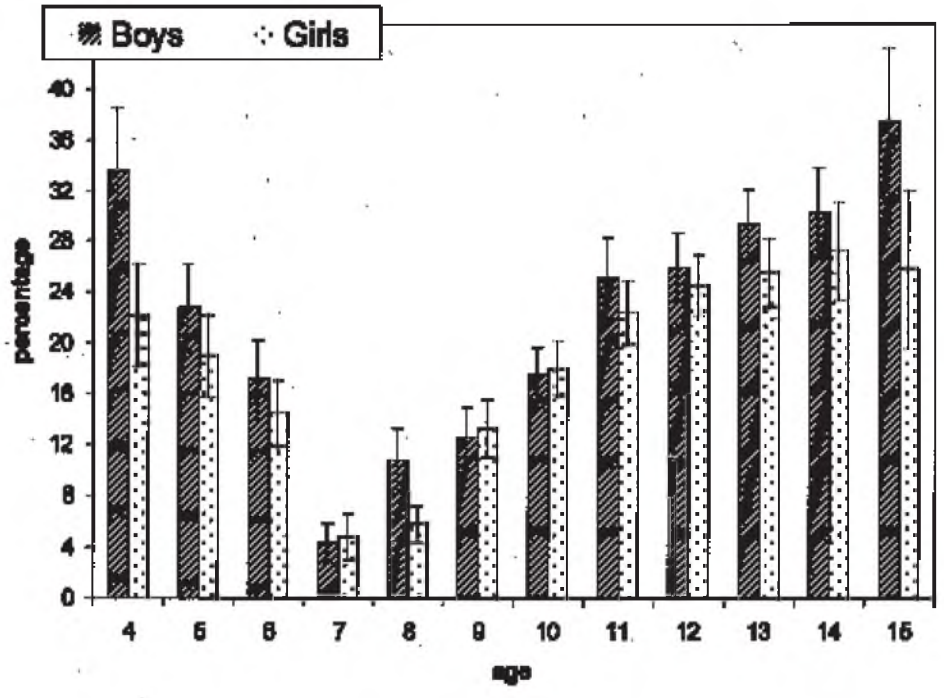


Figure 1. Distribution of untreated dental trauma by age and gender (corrected for district). The vertical lines indicate - SE in the percentage

Table 2. Distribution of untreated dental trauma by district and gender in relation to the number of children with untreated dental trauma

| District | No dental trauma or treated dental trauma | | Untreated dental trauma | | Total | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| District | | | | | | |
| Kinondoni (high SES) | 1762 | 74 | 616 | 26 | 2378 | 52 |
| Ilala (medium SES) | 1039 | 86 | 173 | 14 | 1212 | 27 |
| Temeke (low SES) | 776 | 83 | 158 | 17 | 934 | 21 |
| Gender | | | | | | |
| Male | 1631 | 77 | 480 | 23 | 2111 | 47 |
| Female | 1946 | 81 | 467 | 19 | 2413 | 53 |
| Total | 3577 | 79 | 947 | 21 | 4524 | 100 |

Note: Age is a confounder, thus this table presents a rough estimation of the situation.

Table 3. Types of untreated dental trauma among 947 children*

| Type of injury | n | % of 947 children |
|---|---|---|
| Enamel fracture | 641 | 68 |
| Enamel-dentin fracture without pulp exposure | 245 | 26 |
| Enamel-dentin fracture with pulp exposure | 2 | 0.2 |
| Grey discolouration | 54 | 6 |
| Avulsion | 15 | 2 |
| Intrusion | 1 | 0.1 |
| TOTAL | 958 | 100 |

*Eleven children had 2 injuries each.

## Discussion

The aim of this study was to gain insight into the occurrence of dental trauma in Dar es Salaam in order to create new measures for managing dental trauma in Tanzania. On one hand, counting untreated traumatized teeth may lead to an overestimation of the number of trauma events because in one event several teeth may be involved. That is, the number of traumatized teeth is not equal to the number of trauma events. On the other hand, the observed number of untreated dental trauma may be an underestimation of the real occurrence of trauma in the population of children. Firstly, because no artificial light was used, enamel infractions and fractures on posterior teeth were not recorded whereas root fractures were not recorded because no x-rays were taken. Secondly, a tooth was not scored as having trauma if it first sustained injury and later developed caries but the child could not tell which of the two preceded. However, it has to be kept in mind that Manji et al (14) have reported that dental caries on smooth surfaces of anterior teeth is rare among Tanzanians. Thirdly, injuries like soft tissue and luxation injuries were not included because they were considered to have healed. In addition, traumatized teeth may disappear over time, due to teeth loss from the deciduous dentition, which explains the dip in the age curve. Fourthly, treated trauma may not be recognised. However, the number of treated trauma in this population is very low compared to the untreated trauma. The number of treated trauma may be estimated by utilizing the results from a previous study by Kahabuka et al (15), who reported that on the average 240 patients with dental trauma aged 4-15 years are treated in Dar es Salaam per year. By estimation, there are 1,200,000 children in Dar es Salaam aged 4-15. Thus (1,200,000/240 = 5000) implying that one dental trauma treatment is done per 5,000 children per

year. Or, in other words, one treatment per 5000 child years. In this study 4524 children with a mean age of 10.1 years were involved, which implies 4524 x 10.1 = 46,000 observed (passed) child years. That means 46,000/5000 = 9 treated cases could be expected. The actual number of observed treated trauma in the study was 5, which is in concordance with the expectation. Therefore, observing untreated trauma is valid in this situation.

Gender appeared to influence the prevalence of trauma significantly, where boys were found to have slightly more injuries than girls (p= 0.005). The explanation reported earlier that boys engage in more vigorous activities than girls and therefore are at greater risk of sustaining dental injuries (1) may be applicable to Tanzanian children as well.

Prospective studies document the incidence of dental trauma and associate high percentages at the ages of 2-4 years with the children s learning to walk and explore while their motor co-ordination is not well developed. The observation can also depend on the care system in a given community. In this study, where a period prevalence of dental trauma was recorded, the decrease in percentage at age 5 is accounted for by exfoliation of deciduous teeth. The prevalence is lowest at age seven where most deciduous teeth have exfoliated and the permanent successors either have not erupted or have been in the mouth for a short period. At age eight where the teeth have been in the mouth for at least one year, the prevalence increased to reach its maximum at age 15.

Children in Temeke district were older than those in the other two districts. Probably the low SES of the people in this district compels them to send their children to school at later ages. Therefore the district influences were corrected for age. More injuries observed among children in the district with a relatively higher social economic status may be related to the nature of children s games or activities, which are likely to be influenced by the level of SES.

Recent observations (3-7) report that 7-50% of children had sustained at least one type of an oro-dental injury by the age of 15 years. A comparable observation of (21%) was made in this study. Unlike the patterns of dental caries reported to be different in industrialized as compared to that in developing countries (16-17), this study reports a prevalence of dental trauma in Tanzania similar to that observed in industrialized countries (this study presents city data, figures for rural areas in Tanzania may differ). In deciduous dentition, Mestrinho

(4) and Hargreaves (5) reported occurrence of injuries to be 10-20%. This is slightly lower compared to 29.5% observed among 4 years old children in this study. For thepermanent dentition, Caliskan and T rk n (3), Marcenes et al (6) and Vanderas & Papagiannoulis (7) reported the occurrence ranging between 5.2-45.2% which is comparable to 5.7-32% reported among 7-15 years old children in this study.

The prevalence of untreated dental trauma (21%) observed in this study calls for action from the dental personnel, although most injuries were enamel fracture, followed by enamel-dentin fracture that may not necessarily require treatment. However, since all injuries are potentially prone to complications, it is more logical to prevent the complications by early management and follow-up. Besides, Andreasen (2) and Glendor (18-19), have noted that the treatment for complications of dental trauma are time-consuming and costly. It might therefore be more effective to employ a preventive approach to deal with dental trauma in developing countries like Tanzania where treatment options are scarce. This can be achieved if the public is made aware of the importance of early treatment for dental injuries, as suggested earlier (8-13).

From the findings of this study we conclude that dental traumas are prevalent among Tanzanian children. We recommend that the lay community should be provided with information about the importance of early management of dental trauma, ways of preventing trauma and appropriate handling of avulsed teeth in order to minimize the rate of dental injuries and the related complications.

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# Chapter 3

## Oro-dental injuries and their management among children and adolescents in Tanzania

Kahabuka FK, Willemsen WL, van 't Hof MA, Ntabaye MK, Plasschaert A, Frankenmolen F, Burgersdijk R.

East African Med J 1999;76:160-162

### Abstract

Objectives: To investigate by utilizing patient records, the occurence of the various types of dental trauma and the treatment provided among children aged one to seventeen years.
Design: A retrospective survey of dental clinic records
Setting: Paedodontic clinic of the Faculty of Dentistry, Muhimbili University College of Health Sciences.
Subjects: Records of 130 dental patients aged one to seventeen years who were treated in 1995 and 1996.
Main outcome measure: Types of injuries (periodontal, soft tissue, dental tissues). Types of treatment given in relation to type of injury. Evaluation of treatment provided by using European treatment standards.
Results and conclusion: Soft tissue injuries were recorded in 49% of the patients. Periodontal and dental tissue injuries were recorded in 34% and 8% of the patients respectively. While injured teeth were extracted in 30% of the cases, soft tissues were stitched in 70% and antibiotics were prescribed in 34% of the patients respectively. Evaluation of treatment provided showed that 31%, 52% and 17% of the teeth received the correct, wrong and unnecessary treatment respectively. We concluded that our observations correlate well with other reports. However, efforts in standardisation of treatment for oro-dental injuries should be undertaken.

### Introduction

A number of studies on the occurrence of dental injuries among children and adolescents is available (1-5). Studies conducted in hospital settings frequently report more severe injuries like luxations and bone fractures as compared to teeth fractures (1). A mean of 2 injured teeth per child (1, 2) has been reported, and the maxillary central incisors being the most frequently affected (1, 3, 4). Other

observations have been summarized as follows: boys suffer traumatic dental injuries almost twice as often as girls (2-4), falls and violence or fights are the most common causes of dental trauma (1,3,5), an increased frequency occur at ages of one to four years, (2, 3) eight to twelve years (1,5) and sixteen to eighteen years (2). Various authors (6-8) have recommended treatment modalities for these injuries.

In Tanzania only two studies on oral injuries have been published focusing on maxillo-mandibular fractures (9) and emergency dental visits (10). Little information is available on the situation as far as treatment modalities are concerned in relation to the type and degree of dental injury. The aim of this study was to investigate, by utilizing patient records, the occurrence of the various types of dental traumas and the treatment provided among children aged one to seventeen years.

## Materials and Methods

This study was conducted at Muhimbili Medical Centre (MMC), which incorporates the University of Dar es Salaam teaching hospital.

The clinical registers of the paediatric dentistry clinic and those on the dental ward were examined to prepare a list of patients who were indicated to have sustained oral trauma in the years 1995 and 1996. A total of 142 case records of patients aged one to seventeen years were available for examination. Twelve records were excluded, representing either children with jaw fractures only (n=4), having no information (n=5) or no injury after diagnosis (n=3). Thus records for 130 patients were available for this study. For each patient, the following information was collected: age, gender, type of injury, teeth affected and initial treatment provided. Injuries were recorded according to Andreasen's classification (6). Data entry was done on EPI-INFO, (WHO programme) and analysed using the SPSS package. Chi-square test was used to test statistical significant difference (p  0.05). In order to evaluate the reported treatment choices, we employed a previously reported grading system (11).

## Results

The age and gender distribution of the study group is presented in table 1. Seventy three children (56%) sustained soft tissue injuries, 63 (48%) had injuries to the tooth supporting structures (periodontal injury) and 22 (17%) showed injury to the hard dental structures. Injuries to the lip, tongue and gingiva were the

frequent soft tissue injuries. Avulsion, lateral luxation and intrusive luxation were common periodontal injuries while crown root fracture was a frequent injury to hard dental structures (table 2).

Table 1. Age and gender distribution

| Age (yrs) | Male No (%) | Female No (%) | Total No (%) |
|---|---|---|---|
| 1-3 | 20 (26) | 16 (29) | 36 (28) |
| 4-6 | 24 (32) | 13 (23) | 37 (29) |
| 7-10 | 17 (23) | 18 (33) | 35 (27) |
| 11-14 | 8 (11) | 7 (13) | 15 (11) |
| 15-17 | 6 (18) | 1 (2) | 7 (5) |
| Total | 75 (100) | 55 (100) | 130 (100) |

Twenty five children (19%) sustained injuries to one tooth, 34 (26%) children had injuries to two teeth and 20 (15%) children injured three or more teeth. All together, seventy nine children presented with a total of 181 injured teeth, (mean = 2.3 teeth per child). Of the 175 teeth whose type was indicated, deciduous teeth constituted 42% and permanent teeth 58%. The upper incisors were the most frequently affected teeth (78%), while canines, premolars, and molars were least affected, (table 3).

Causes of injury were not specified in 48% of the children. However, falls while playing or walking were the main cause of injury followed by road traffic accidents and assaults.

Table 2 Types of injuries

| Type of injury | No (%) |
|---|---|
| Soft tissue injury | |
| Lip | 24 (37) |
| Tongue | 17 (27) |
| Gingiva | 11 (17) |
| Skin | 8 (12) |
| Cheek | 3 |
| Palate | 1 (2) |
| Total specified | 64 (100) |
| Not specified | 9 |
| Total | 73 |
| Periodontal injury | |
| Avulsion | 15 (34) |
| Lateral luxation | 11 (25) |
| Intrusive luxation | 10 (23) |
| Extrusive luxation | 4 (9) |
| Sub luxation | 4 (9) |
| Total specified | 44 (100) |
| Not specified | 19 |
| Total | 63 |
| Injury to hard dental tissues | |
| Crown root fracture | 4 (37) |
| Enamel-dentine fracture without pulp exposure | 3 (27) |
| Enamel fracture | 2 (18) |
| Enamel-dentine fracture with pulp exposure | 1 (4) |
| Apical half root fracture | 1 (9) |
| Total specified | 11 (100) |
| Not specified | 11 |
| Total | 22 |

Note: Some patients sustained more than one injury

Table 3 Percentage distribution of injured teeth

| | Deciduous | Permanent | Total |
|---|---|---|---|
| | No (%) | No (%) | No (%) |
| Upper central incisor | 47 (63) | 58 (57) | 105 (61) |
| Upper lateral incisor | 16 (22) | 21 (21) | 37 (21) |
| Lower central incisor | 2 (3) | 11 (11) | 13 (8) |
| Lower lateral incisor | 1 (1) | 9 (9) | 10 (5) |
| Canines, premolars and molars | 8 (11) | 2 (2) | 10 (5) |
| Not specified | - | - | 6 |
| TOTAL | 74 (100) | 101 (100) | 181 (100) |

Of the injured teeth, no treatment was given for 70 (41%) teeth, while 52 (31%) teeth were extracted. Often the treatment for soft tissue injuries was stitching (70%). Repositioning and immobilization was done for 45 (32%) teeth out of 143 teeth that sustained injury to tooth supporting structures. Restorative procedures were done for four (17%) teeth out of the 23 teeth that sustained injury to hard dental tissues. Antibiotics were prescribed for 34% of the children. These were more frequently prescribed for soft tissue injuries than hard tissue injuries ($p = 0.001$). Evaluation of treatment provided to 107 teeth with full information shows that 33 (31%) teeth received correct treatment 56 (52%) teeth received wrong treatment, and 18 (17%) teeth received unnecessary treatment.

## Discussion

The child population in the regions where children in this study originated is not known, besides, the data presented is hospital based, therefore, this study can not present incidence rates of dental injuries. Some information could not be retrieved; especially causes of injury and follow-up visits. These drawbacks should be considered when comparing the results with other studies.

Despite the above limitations, there is agreement between our observations and others. The high percentage of trauma patients at age of one to ten years falls within the range reported elsewhere (1-3,5), except in the higher age group of 16-18 years. An increased vulnerability to injuries at lower ages has been associated with learning to walk and explore by these children while their motor co-ordination is not well developed. The maxillary central incisors were the most frequently affected teeth, as has been reported elsewhere (1, 3, 4). The position of the maxillary incisors, the presence of incompetent lip coverage or Angle's class II malocclusion

which are related to these teeth being prone to accidental injuries (12) will have similar influences in all populations. Most commonly soft tissue injuries inluding periodontal injuries alone or in combination were seen in the present study.

Based on reports that fractured teeth are frequently seen in health clinics, school programmes and dental offices (13), and on the current observation where few injuries to hard dental tissues were treated at MMC, it is speculated that in Tanzania most injuries to hard dental tissues are left untreated, because there are no active dental school health programmes.

In order to maintain traumatised teeth, excellent emergency treatment, appropriate long term follow-up (6), the knowledge and skills of the dentists involved (14), availability of equipment and materials as well as community awareness are essential. The above factors are generally more appealing in Western countries than in developing countries such as Tanzania. These differences are thought to contribute to the reported treatment in this study where unlike in Western countries, the injured teeth were often extracted, and a few teeth received the correct treatment as observed upon evaluation based on Western country standards. Regarding antibiotics, their use is more restricted in Western countries compared to Tanzania.

It may be concluded that the observations of this study correlate well with other studies, but grading of reported treatment based on treatment standards for Western countries implied some controversy. Therefore, it is recommended that efforts on standardisation of treatment and introduction of a better recording system should be undertaken, taking into account the socio-economic, cultural and dental characteristics of the population involved.

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# Chapter 4

## Initial treatment of traumatic dental injuries by dental practitioners

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### Abstract

The aim of this study was to investigate the nature of initial treatment provided by dental practitioners to children aged 1-17 years with various types of traumatic dental injuries at public dental clinics in Tanzania. Questionnaires on initial treatment were mailed to 188 practitioners and were returned by 138 (73%). The reported treatments were analyzed in relation to the dental practitioners qualifications and area of practice. Extraction of injured teeth was frequently reported for 64% of the injuries and prescription of antibiotics was reported by 67%, 48% and 46% of the practitioners for soft tissue injuries, concussion, and alveolar fracture respectively. Practitioners working at the Faculty of dentistry were less involved in treating dental trauma than those at urban and rural clinics, ($p = 0.001$), while no significant association was found with the level of education of the practitioners. Equal proportions of practitioners, about one-third each reported correct, unnecessary and wrong treatment options. The quality of the treatments provided could not be explained by background variables. It can be concluded that dental practitioners in Tanzania provide a lot of over-treatment for traumatic dental injuries. Therefore, it is suggested that efforts should be made to improve and standardize treatment methods in the Tanzanian.

### Introduction

Immediate care for traumatized teeth and the future dental health of the patient requires not only excellent emergency treatment but also appropriate long term follow-up (1), and depend as well on the knowledge and skills of the dentists involved (2). Despite the importance of the dental professionals' knowledge on treating dental traumas, little has been done in this area. Hamilton et al, (3) have conducted a study to assess dentists' knowledge, and perceived barriers to treatment of dental injuries. They conclude that dentists providing primary care

have insufficient knowledge to treat dental trauma and propose that more postgraduate and in-service training should be offered. While the above proposal is commendable, it seems reasonable first to document the treatment given to various types of injuries as a basis for planning training. The aim of this study was to investigate initial treatment provided by dental practitioners to Tanzanian children with traumatic dental injuries.

## Subjects and Methods

A total of 204 dental practitioners, registered as employees at government hospitals on mainland Tanzania, were eligible to take part in the study. A list of these practitioners was obtained from the Central Oral Health Unit of the Ministry of Health, Dar es Salaam. Sixteen practitioners were excluded beforehand because of administrative responsibilities, incomplete addresses, retirement or job change. For each practitioner information on qualifications, working experience and area of practice was abstracted and recorded. Questionnaires were mailed to 188 dental practitioners: 65 (35%) dentists, 48 (25%) assistant dental officers and 75 (40%) dental therapists. The questionnaire asked about the initial treatment of 22 types of injuries. Nineteen treatment choices were provided and practitioners could choose more than one treatment when applicable. Additional questions were on dental consultation, follow-up visits and instructions to patients. Questionnaires were returned by 138 (73%) dental practitioners. The practitioners workplaces were, the Faculty of Dentistry (n=29, 21%), regional hospitals or training institutions (n=57, 41%), and district hospitals (n=52, 38%) (table 1). Forms from four dentists were excluded from detailed analysis owing to reported lack of involvement in treating dental trauma.

Table 1. Distribution of study group by qualification and participation

| | Dentists | Assistant dental officers | Dental therapists |
|---|---|---|---|
| | no. (%) | no. (%) | no. (%) |
| Participants | 56 (86) | 33 (69) | 49 (65) |
| Non-participants | 9 (14) | 15 (31) | 26 (35) |
| Total | 65 (100) | 48 (100) | 75 (100) |

In order to evaluate the reported treatment choices, a response matrix was prepared on the basis of recommendations by Andreasen (1), McTigue (4) and The American Association of Endodontics (5). In this matrix, (table 2), the treatment options were rated for each type of injury into: correct (treatment that has to be done at first visit), unnecessary (treatment that may be done at follow-

up visits or in case of complications), and wrong (treatment that should not be done).

Table 2. Rating initial treatment choices into correct, unnecessary and wrong

| | Treatment options (see key below) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of injury | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Enamel infraction | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | + |
| Enamel fracture | + | + | 0 | 0 | 0 | - | - | - | - | - | - | - | - | - | - | - | - | + |
| Uncomp. enamel-dentine fracture | - | - | + | + | + | - | - | - | - | - | - | - | - | - | - | - | - | + |
| Comp. enamel-dentine fracture | - | - | + | + | + | + | + | 0 | 0 | - | - | - | - | - | - | - | - | + |
| Crown root frac. of decid. teeth | - | - | - | - | - | - | - | - | + | - | - | - | - | - | - | - | - | + |
| Uncomplicated crown root fracture of permanent teeth | - | - | + | + | + | - | - | - | - | - | - | - | - | - | - | - | - | + |
| Complicated crown root fracture of permanent teeth | - | - | + | + | + | - | - | + | + | - | - | - | - | - | - | - | - | + |
| Root fracture of deciduous teeth | + | - | - | - | - | - | - | - | 0 | - | - | 0 | 0 | - | - | - | - | + |
| Horizontal root fracture in apical half of permanent teeth | - | - | - | - | - | - | - | 0 | 0 | 0 | - | - | + | - | - | - | - | + |
| Horizontal root fracture in coronal half of permanent teeth | - | - | - | - | - | - | - | 0 | 0 | 0 | - | - | + | - | - | - | - | + |
| Concussion | + | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | + |
| Sub-luxation | + | - | - | - | - | - | - | - | - | - | - | 0 | - | - | - | - | 0 | + |
| Lateral luxation of decid. teeth | + | - | - | - | - | - | - | - | 0 | 0 | - | 0 | - | - | - | - | 0 | + |
| Lateral luxation of perm. teeth | - | - | - | - | - | - | - | 0 | 0 | + | - | + | - | - | - | - | 0 | + |
| Intrusive luxation of decid. teeth | + | - | - | - | - | - | - | 0 | 0 | 0 | - | 0 | - | - | - | - | 0 | + |
| Intrusive luxation of perm. teeth | - | - | - | - | - | - | - | + | 0 | 0 | - | 0 | - | - | - | - | 0 | + |
| Extrusive luxation of decid. teeth | + | - | - | - | - | - | - | - | 0 | - | - | 0 | - | - | - | - | 0 | + |
| Extrusive luxation of perm. teeth | - | - | - | - | - | - | - | 0 | 0 | + | - | + | - | - | - | - | 0 | + |
| Avulsion of decid. teeth | + | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | - | 0 | + |
| Avulsion of perm. teeth | - | - | - | - | - | - | - | 0 | - | - | + | + | - | 0 | 0 | 0 | 0 | + |
| Alveolar fracture | - | - | - | - | - | - | - | - | - | - | - | - | + | - | 0 | 0 | 0 | + |
| Soft tissue injuries | - | - | - | - | - | - | - | - | - | - | - | - | - | - | + | + | 0 | + |

Rating key: + = correct, 0 = unnecessary, - = wrong

Treatment options: 1. observation; 2. selective grinding; 3. reattachment of fractured tooth; 4. buid-up with composite; 5. build-up with glass ionomer cement; 6. pulp capping; 7. pulp amputation; 8. root canal treatment; 9. extraction; 10. repositioning; 11. flexible splinting; 14. prosthesis; 15. cleaning; 16. stitching; 17. antibiotics; 18. referral.

Data entry was done on EPI-INFO (WHO program) and analyzed using the SPSS package. The reported treatments were analyzed in relation to the dental practitioners qualifications, working experience and area of practice. One way ANOVA, Pearson and Spearman correlations and chi-square test were used to test statistical significance relationships at alpha = 0.05.

Table 3. Most frequently reported treatments by type of injury

| Type of injury | Treatment | Percentage of practitioners reporting the treatment |
|---|---|---|
| Crown root fracture of deciduous teeth | Extraction | 92 |
| Root fracture of deciduous teeth | Extraction | 90 |
| Complicated crown root fracture of permanent teeth | Extraction | 77 |
| Horizontal root fracture in apical half of permanent teeth | Extraction | 73 |
| Horizontal root fracture in coronal half of permanent teeth | Extraction | 72 |
| Extrusive luxation of deciduous teeth | Extraction | 72 |
| Intrusive luxation of deciduous teeth | Extraction | 65 |
| Lateral luxation of deciduous teeth | Extraction | 54 |
| Avulsion of deciduous teeth | Extraction | 48 |
| Complicated enamel-dentin fracture | Extraction | 47 |
| Uncomplicated crown root fracture of permanent teeth | Extraction | 47 |
| Intrusive luxation of permanent teeth | Extraction | 47 |
| Extrusive luxation of permanent teeth | Extraction | 45 |
| Avulsion of permanent teeth | Extraction | 35 |
| | Re-planting | 35 |
| Uncomplicated enamel-dentin fracture | Build-up with composite or GIC | 89 |
| Soft tissue injuries | Stitching | 80 |
| Enamel infraction | Observation | 75 |
| Concussion | Observation | 63 |
| Enamel fracture | Selective grinding | 51 |
| Alveolar fracture | Antibiotics | 50 |
| Lateral luxation of permanent teeth | Repositioning | 45 |
| Sub-luxation | Rigid splinting | 44 |

## Results

For each type of injury, the treatments reported most frequently are shown in table 3. Extraction was most frequently reported, for 14 (64%) out of 22 dental injuries. The highest percentage of extraction was reported for crown root fracture and root fracture of deciduous teeth (87%), complicated crown root fracture of permanent teeth (72%) and extrusive luxation of deciduous teeth (70%). Some dental practitioners reported extraction in case of avulsion of deciduous teeth (46%), avulsion of permanent teeth (33%), concussion (7%), and enamel infraction (2%). On average, extraction was the treatment of choice at the Faculty of Dentistry in 6 of the 22 types of dental injuries, while at regional (urban) hospitals extraction was carried out in 9 injuries and at district (rural) hospitals in 8 injuries (one-way ANOVA, $P = 0.0001$).

Treatment of the pulp was reported by 73% of the practitioners at the Faculty of Dentistry, as compared to only 45% of the other dental workers (chi-square, P = 0.03).

Antibiotics were reported to be prescribed by about two thirds of practitioners (67%) for soft tissue injuries, whereas for concussion and for alveolar fracture the percentage were (48%) and (46%) respectively.

Practitioners working at the Faculty of Dentistry reported treating 84% of the 22 various dental traumas, while practitioners working elsewhere reported treating 95% of the various dental traumas, (one-way ANOVA, P = 0.001). Practitioners with shorter working experience reported treating more types of dental trauma than those with longer working experience (Spearmen correlation = -0.31, P = 0.008). For each level of education and place of work, the correlation remained negative, (r range: -0.23 to -0.35).

When all answers on treatment provided were grouped into correct, unnecessary and wrong, it was found that about equal proportions of the reported treatments, one third each, fell into the categories correct, unnecessary and wrong (Table 4). When the influence of qualification, area of practice and self rating of education to treat dental trauma were analyzed, it was shown that the quality of the treatments could not be explained substantially by background variables, (one-way ANOVA).

Most dental practitioners reported that dental trauma patients seek dental consultation immediately (28%) or within 7 days (40%), that their compliance with instructions given after dental trauma is good (46%) or satisfactory (36%) and that patients attend follow-up appointments either often (32%) or sometimes (48%).

Table 4 Quality of the reported treatment for 22 types of injury (n=134)

| Quality | Mean (sd) | % (sd) of answers |
|---|---|---|
| Wrong | 11.7 (9.3) | 32 (12) |
| Unnecessary | 12.4 (5.3) | 38 (11) |
| Correct | 9.7 (4.1) | 30 (10) |
| Total | 33.7 (14.9) | 100 |

## Discussion

This study was conducted among dentists, assistant dental officers and dental therapists, representing three different levels of training. While level of training may influence treatment provided, in practice these practitioners attend patients irrespective of their training, and therefore it was considered appropriate to give them the same questionnaire. At the Faculty of Dentistry, there are more practicing dentists with some specialization than anywhere else in the country. This distribution may explain why individual dentists at the faculty were on average found to have treated fewer cases of dental trauma. The fact that practitioners with shorter working experience or lower qualification level reported treating more cases of dental trauma than those with longer experience or higher qualification may be explained by the existing organization principle. As a rule, when dentists, assistant dental officers and dental therapists are employed at one working place, the dentists or practitioners with longer working experience will be engaged in administrative responsibilities besides clinical duties, and therefore will have less opportunity to treat patients.

Dentists were expected to report more correct treatment than assistant dental officers and dental therapists; likewise dental practitioners who graded themselves as having high qualifications in dental trauma treatment. But these two background factors were not predictable for the quality of the answers given. The reasons for this observation may be a lack of dentists with special interest in dental traumatology who could give adequate training to dental students, and lack of in-service training.

Extraction of injured teeth was frequently reported as the treatment of choice probably because of limited knowledge of dental practitioners on treatment options, or because patients developed complications as a result of delaying dental consultation. Practitioners who reported extracting teeth with enamel infraction, concussion and avulsion may be thought to have misunderstood the types of injury. However, this is unlikely, since on the questionnaire each type of injury was explained. Probably, the long time that elapsed from injury to consultation was associated with unexpected extraction as well as prescription of antibiotics. Moreover, dental practitioners may prescribe antibiotics as a preventive measure or as a treatment for an already existing infection, since occurrences of secondary infection are not uncommon in Tanzania.

The equal proportions of practitioners reporting correct, unnecessary and wrong treatment options on the one hand imply that these practitioners use outdated treatment methods because of lack of in-service training, or that they do not have sufficient knowledge, as suggested by Hamilton et al (3). On the other hand, the questionnaire may have been too complicated for some practitioners despite the explanation given for each type of injury, or the recommendations for treating dental trauma (1, 4, 5) used to rate the practitioners responses may not have been suitable in the Tanzanian situation. As suggested earlier by Andreasen (1) and Rusmah (2) it would be valuable to update the knowledge and skills of the Tanzanian dentists on emergency treatment and appropriate long term follow-up.

On the basis of most practitioners' reports about patient compliance with instructions and follow-up visits, as well as time lapse between injury and dental consultation, it is recommended that lay people should be educated on what to do in the event of dental trauma.

From the findings of this study, it can be concluded that dental practitioners in Tanzania overtreat certain traumatic dental injuries. It is therefore suggested that efforts should be made to standardize the treatment methods for traumatic dental injuries in Tanzania.

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# Chapter 5

## Testing a consensus conference method in Africa by discussing the management of traumatic dental injuries in Tanzania

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East African Medical Journal 2000;77:552-557

### Abstract

Objectives: To test the recommended consensus conference methods in Tanzania by discussing the management of traumatic dental injuries, and to reach consensus on how far the treatment modalities of traumatic dental injuries recommended in Western countries are feasible in the Tanzanian situation.
Study participants: Fifteen Dentists as representatives of the profession and two lay peolpe as representative of potential consumers
Interventions: Presentation of treatment modalities for traumatic dental injuries recommended in Western countries
Main outcome measure: Consensus on treatment modalities of traumatic dental injuries feasible in the Tanzanian situation
Results: For most types of injuries, consensus on treatment methods feasible for Tanzania was reached immediately. More time was spent to discuss management of some injuries where the members felt that the recommended management regimes for these injuries are not feasible in the current Tanzanian situation. Panel members made three recommendations. First, parents and teachers should be provided with guidelines or instructions about self-care following trauma. Second, teaching on the management of traumatic dental injuries at training institutions should be emphasised and third, dental practitioners at dental clinics in the country should get continuing education about the management of traumatic dental injuries.
Conclusion:The methods for achieving consensus were useful in the Tanzanian dental situation, therefore it is recommended that the methods be adopted to reach consensus on other oral health issues.

### Introduction

Consensus development conference methods are used as tools for solving problems in health and medicine. Their main purpose is to define levels of

agreement on controversial subjects (1-3). Consensus conference methods were developed by the National Institute of Health (NIH) in the United States in 1977 (4) and have been adopted and modified by a number of countries (5). Several conferences have been conducted to discuss different health issues (1). With respect to oral health, to our knowledge, only a few consensus conferences have been held to discuss oral health issues (6-8). Although a large number of conferences have been conducted, Fink (1) reported that several questions have been raised regarding the strength of consensus methods. Some questions inquire on whether the support of consensus is warranted, whether results of consensus are valid, and to what extent the consensus statements issued are disseminated. Finally, inquiries are on whether the changes in physician behaviour are associated with consensus statement. Despite these queries, Fink (1) reported that the use of consensus appears to be increasing. Steps to be set before staging the consensus conference include selection of the problem(s), selection of panel members, presenters, chairman and preparation of background information (1, 5, 9).

According to the NIH-consensus method, it is recommended that a consensus conference begins with a plenary session, during which experts or representatives of task forces present information on the state of the science (9). Questions and comments follow presentation. The panel then convenes to reach consensus on the answers to the questions being addressed and produces a report incorporating the conclusions reached by working groups. At the final plenary session, the consensus statement is presented to the audience for comments and endorsement. After staging the conference, organisers should obtain professional and political support, and disseminate results of the conference to relevant bodies.

The current consensus conference was organised in response to the findings of a previous study that investigated initial treatment for traumatic dental injuries provided by dental practitioners in Tanzania (10). In this study dental practitioners frequently reported to extract the injured teeth and to prescribe antibiotics. Furthermore, the reported treatments were rated into "correct", "unnecessary" and "wrong", based on recommendations advocated in Western countries. The results of this rating showed that one third of the reported treatment options were correct, one third were unnecessary and the other third were wrong. Bearing in mind that the success in the management of traumatic dental injuries depends among other things on the knowledge, experience and dedication of dental practitioners, the findings of this study stimulated the investigators to organise a

consensus conference. Although there is a lot known about consensus conference, there is no information as to whether a consensus conference has been conducted in the African setting. The aim of this conference was therefore to test the recommended methods in Tanzania by discussing the management of traumatic dental injuries and to reach consensus on how far the treatment modalities of traumatic dental injuries recommended in Western countries are feasible in the Tanzanian situation. In this paper the methodology as used is described and the experiences are analysed.

## Methodology

### Pre-panel process

Most countries spend between six months and one year planning for a consensus conference. Six months were spent to prepare the current conference in selecting information and to find the optimal setting.

### Selection of the topic

The current topic was selected after observing the treatment modalities of traumatic dental injuries among dental practitioners of which one third was wrong and one-third unnecessary (10). In another study (11), few injuries to hard dental tissues were being treated at the University teaching hospital, giving a speculation that most injuries to hard dental tissues are left untreated. Due to the above reasons, the prevailing situation on management of oral-dental injuries was thought to require improvement. The topic was considered appropriate and of potential importance to dental public health in Tanzania.

### Selection of panel members

It has been recommended that principal participants of a consensus conference should be representatives of the profession or have power to implement the findings and that whenever possible, potential consumers should be included (1, 2, 9). The panel of the current conference was therefore formed by Regional Dental Officers, Heads of Dental teaching institutions, and two lay persons as representatives of caretakers for future patients (a parent and a primary school teacher). Twenty-five individuals were invited to the conference of which, fifteen dentists, and the two lay people attended the conference. The fifteen dentists comprised the Chief Dental Officer, ten Regional Dental Officers, three heads of Dental Schools, and a co-ordinator of the Paedodontics course at the Faculty of Dentistry.

Table 1: Types of injury ranked according to easiness of reaching consensus on their management

| Injury | Immediate consensus | Relatively easy to reach consensus | More time needed to reach consensus |
|---|---|---|---|
| Enamel fracture | X | | |
| Crown root fracture of deciduous teeth | X | | |
| Uncomplicated crow-root fracture of permanent teeth | X | | |
| Complicated crown-root fracture of permanent teeth | X | | |
| Root fracture of deciduous teeth | X | | |
| Concussion | X | | |
| Sub-luxation (loosening) | X | | |
| Avulsion of deciduous teeth | X | | |
| Lateral luxation of deciduous teeth | X | | |
| Lateral luxation of permanent teeth | | X | |
| Intrusive luxation of deciduous teeth | | X | |
| Extrusive luxation of deciduous teeth | | X | |
| Alveolar fracture | | X | |
| Soft tissue injuries | | X | |
| Enamel infraction | | | X |
| Uncomplicated enamel dentine fracture | | | X |
| Complicated enamel dentine fracture | | | X |
| Horizontal root fracture of permanent teeth | | | X |
| Intrusive luxation of permanent teeth | | | X |
| Extrusive luxation f permanent teeth | | | X |
| Avulsion of permanent teeth | | | X |

Selection of Facilitators/Presenters/Chairman

There were two conference facilitators. A specialist in paediatric dentistry, Dr. W. Berendsen (WB) and a specialist in endodontics, Dr J. P. Bressers (JPB) from the University of Nijmegen, The Netherlands.

The chairman was identified in accordance to recommendations (1,3) that the qualifications of panel chair should be fairly general: stature as a scientist and leadership, and that he/she must have no established opinions on the technology under consideration. Consequently, the Chief Dental Surgeon in Tanzania (Dr. HJ Mosha) was selected to chair the conference.

Information for participants

An invitation letter and literature concerning recommended treatment methods of traumatic dental injuries were mailed to all panel members, one month before the conference (the material is available from the first author).

Consensus panel meeting (Conduct of the conference)

The conference was conducted at Muhimbili University College of Health Sciences, in Dar es Salaam on 2nd and 3rd March 1998. A day before the conference, the facilitators, the chairman of the conference and the organisers held an executive session to discuss the logistics of the conference. A draft of a table to record the discussion as prepared by the organisers (FKK & MKN), was presented together with a conference programme. The draft and programme were reviewed and finalized.

The conference adopted the recommended steps (1, 3, 9). On the first day, the first facilitator (WB) presented the classification, aetiology, epidemiology and examination of traumatic dental injuries. Later, the second facilitator (JPB) gave a presentation on the recommended treatment methods of injuries to the hard tissues, soft tissue injuries and of injuries to the supporting structures in the permanent dentition. Panel members discussed the presentation and recommended treatment methods for each type of injury, feasible in the Tanzanian situation.

On the second day, the first facilitator (WB) presented the treatment methods of traumatic injuries in the primary dentition. Panel members discussed the presentation and recommended treatment methods for each traumatic injury in the primary dentition feasible in the Tanzanian situation. After the presentation and discussion, a draft of recommended treatment for traumatic dental injuries (in primary and permanent dentition) as well as the suggested treatment methods feasible for Tanzania was printed and distributed to all panel members. The draft was equivalent to what is presented in table 2. Panel members were given time individually to read the recommendations and prepare their final contributions. After individual reading, members convened again and made final recommendations of treatment methods for traumatic dental injuries feasible in Tanzania.

Results

Treatment modalities feasible in Tanzania

For most types of injuries, consensus on treatment methods feasible for Tanzania was reached immediately. However, panel members spent more time to discuss management of some injuries where the members felt that the recommended management regimes for these injuries are not feasible in the current Tanzanian situation (table 1). The main reasons for this perspective were mainly

unavailability of materials and equipment required to treat the injuries, and lack of community awareness. Other reasons were said to be lack of or unreliable electric supply (table 2). Most panel members felt that it was necessary to give antibiotics as a preventive measure against secondary infection. After a long discussion, it was agreed that antibiotics are necessary only for medically compromised patients.

Ratification of a consensus statement

The consensus statement was submitted to the Chief Dental Surgeon (CDS) for ratification. In Tanzania dental clinics and a large workforce is owned by the Government and thus under the administration of the CDS. Therefore, ratification from him was considered adequate. A statement of ratification was received from the Chief Dental Surgeon.

Dissemination of a consensus statement

After ratification, the consensus statement was distributed to all dental practitioners in Tanzania and was made available in the Library of the Faculty of Dentistry. In addition, it is planned that the statement will be presented during one of the scientific conferences of the Tanzania Dental Association. To investigate the willingness to use the consensus statement, all 209 dental practitioners were provided with the consensus statement and were requested about their willingness. Fifty-seven per cent (57%) of the dentists responded and indicated their intention to use the consensus statement.

## Discussion

This conference was the first consensus meeting to be held in Tanzania to discuss an oral health problem. Fifty eight percent of invited members attended the conference. It was learnt that the main reason for non-attendance was communication problems. The conference lasted for two days, the duration recommended by founders of consensus methodology (1-4). Panel members participated actively in the discussion and consensus was reached. Most panel members perceived the conference as a continuing education session. This provides a difference between the current conference and previous conferences conducted elsewhere whereby experts of a certain speciality meet to resolve a controversy issue.

During the discussions, dental practitioners revealed that most Tanzanians would not perceive crown fractures as a medical/dental problem especially when there

are no soft tissue injuries. Therefore lack of awareness may contribute to delay in seeking dental consultation. Members reported lack of equipment and materials as well as limited knowledge and experience to be stumbling blocks in early management of traumatic dental injuries. These problems together with lack of community awareness influence the choice of treatment.

Although an obvious gap was observed between the facilitators knowledge and experience, and that of panel members, a calm discussion prevailed and consensus was reached. The difference in knowledge may have influenced the validity of the consensus statement since Tanzanian dental practitioners had a limited contribution. Therefore a follow-up investigation seems inevitable.

In addition to reaching consensus, panel members made three recommendations to facilitate proper management of traumatic dental injuries. The first recommendation was that parents and teachers should be provided with guidelines or instructions about self-care following trauma. Accordingly, guidelines for schoolteachers were prepared and distributed to primary schools in one region. The effectiveness of these guidelines will be assessed. Using results from this assessment, a wider coverage of the country will be planned. Guidelines for parents will be prepared later. A second recommendation was that teaching on the management of traumatic dental injuries should be emphasised at training institutions namely the Faculty of Dentistry and the Assistant Dental Officers School. Implementation of this recommendation has started at the Faculty of Dentistry while efforts will be made to emphasize teaching at the Assistant Dental Officers School. The third recommendation was that Dental practitioners at dental clinics in the country should get continuing education about the management of traumatic dental injuries. The Chief Dental Officer is planning a continuing education workshop for dental practitioners.

A great part of the methods in the current consensus conference was according to recommendations derived from literature (1,3,9), except that the seminar participants were not experts in the area under study. Instead, they were the professional administrators who will be influential in supporting dissemination of the consensus statement and the related recommendations. This variance was due to the fact that the controversy issue on the management of dental trauma was reported by investigators, unlike in literature where controversy arises from the practitioners themselves. Besides, in Tanzania there are no experts for the management of dental trauma. Despite this deviation, the outcome of the

conference shed light on what were the reasons behind the treatment choices provided by Tanzanian dental practitioners appearing different from the treatment modalities recommended in Western countries.

The consensus statement (table 2) was made available to all relevant parties. Therefore it is expected that the statement will influence dental practitioners choice of treatment modalities. However, changing of any behaviour requires constant reinforcement. Besides, the authors can not guarantee the actual use, instead they will continue to motivate practitioners to refer to the consensus statement whenever a patient with trauma seeks dental consultation at their clinics. A follow up study to assess the effectiveness of the dissemination is recommended.

The methods for achieving consensus used in the current conference were found to be useful for the Tanzanian situation. It is recommended therefore that the methods be adopted for other oral health issues requiring a solution. However, it is proposed that in future, organisers of a conference should prepare a list of controversy issues, send the list to potential participants to give them an opportunity to participate in selecting a topic for discussion.

## Acknowledgement

The authors thank Dr H.J. Mosha for chairing the conference, Dr W. Berendsen and. Dr J.P. Bressers for facilitating the conference and all panel members for their participation.

The University of Nijmegen through the WHO Collaborating center for Oral Health Care Planning and Future Scenarios sponsored the conference.

Table 2: Recommendations for management of different types of dental injuries in Tanzania
Table 2a:Recommended treatment for crown and root fractures

| Injury | Recommended management in Western Countries* | Management recommended for Tanzania | Limitations/constraints |
|---|---|---|---|
| Enamel infraction. | No treatment is required. Control X-ray to rule out other fractures and complications | Diagnostic X-ray and follow-up. Advice parents and teachers about possible complications | Not perceived as a problem. |
| Enamel fracture. | Smoothen sharp irritating edges. | Smoothen sharp irritating edges. | Lack of X-ray equipment |
| Uncomplicated enamel dentine fracture. | Permanent teeth-restore with composite. | Permanent teeth :Small part of dentine-round it up<br>i. Big part of dentine-restore with composite or GIC or refer<br>ii. Diagnostic X-ray and follow-up | Composite is not always available |
| | Deciduous teeth - Grinding, fluoride varnish , composite restoration | Deciduous- grinding, restore with glass ionomer cement or composite, Diagnostic X-ray and follow-up | |
| Complicated enamel dentine fracture | Permanent Small exposure seen soon after injury restore with composite or reattach fragment. | Permanent: No delay, no bleeding: seal with calcium hydroxide and restore with glass ionomer cement or composite | |
| | Small exposure (delayed treatment) remove an inflamed pulp then restore with composite or reattach fragment. | Late comer and bleeding: | |
| | If pulp necrosis occurs:<br>Teeth with open apex do apexification.<br>Teeth with closed apex do endodontic treatment immediately. | Open apex: Remove part of inflamed pulp apply calcium hydroxide and restore.<br>Closed apex: Do endodontic treatment | Poor patient compliance with follow-up |
| | Deciduous Pulpotomy or Extraction | Deciduous-extraction | |
| Crown root fracture of deciduous teeth | Extraction | Extraction | None |
| Uncomplicated crown root fracture of permanent teeth | Small part involved - restore a fractured crown, leave alone a fractured root segment<br>Big part of the root involved, control bleeding then restore a fractured fragment otherwise, extract the tooth | Small part involved; -restore a fractured crown, leave alone a fractured root segment<br>Big part involved - extract the tooth | Lack of equipment |
| Complicated crown root fracture of permanent teeth | If bleeding can be controlled, endodontic treatment and restoration with composite.<br>In most cases extraction | Extraction | Lack of materials |

* References (12-15)

Table 2b: Recommended treatment for root fractures and luxation injuries

| Injury | Recommended management in Western Countries* | Management recommended for Tanzania | Limitations/constraints |
|---|---|---|---|
| Root fracture of deciduous teeth | Extraction of coronal part | Extraction of coronal part | None |
| Horizontal root fracture of permanent teeth | No mobility -Rigid splint X-ray is essential<br>In case pulp necrosis occurs, do endodontic treatment of coronal part and extract the apical part. | No mobility no treatment, control x-ray and follow-up<br>Mobility present- splint the tooth with composite or cold cure.<br>Control x-ray and follow-up | Uncertainty in availability of materials. |
| Concussion | No treatment is required. Advise good oral hygiene, follow-up. | No treatment is required. Advise good oral hygiene, follow-up. | None |
| Sub-luxation (loosening) | No treatment is required. Advise good oral hygiene, follow-up.<br>In case of occlusal interference, relieve occlusion. Follow-up | No treatment is required. Advise good oral hygiene, follow-up.<br>In case of occlusal interference, relieve occlusion. Follow-up | None |
| Lateral luxation of deciduous teeth | Usually no treatment is required if the crown is displaced lingualy and apex displaced labialy. If the tooth is displaced into the tooth germ, extraction is the treatment of choice. Follow-up | Extraction | Lack of X-ray machine |
| Lateral luxation of permanent teeth | Reposition the tooth. In case of complications, do endodontic treatment | Reposition the tooth. In case of complications, do endodontic treatment | None |
| Intrusive luxation of deciduous teeth | No permanent tooth germ involvement, await re-eruption in twelve months. If intruded towards the germ, extract the tooth.<br>Follow-up | No permanent tooth germ involvement, -chlorhexidine mouthwash for four days.<br>If intruded towards the germ, extract the tooth.<br>Follow-up | |
| Intrusive luxation of permanent teeth | Await for spontaneous re-eruption. If it does not occur in one and a half months, do orthodontic extrusion.<br>Closed apex - do endodontic treatment.<br>Open apex - do follow-up. | Extrude the tooth with a forceps, apply a flexible splint for 7 to 10 days (using available materials e.g. manila, fishing line or iron wire), do endodontic treatment before removing the splint | It is difficult for patients to come back for follow-up on routine appointments.<br>Lack of thin wire, plastic string and composite. |
| Extrusive luxation of deciduous teeth | Extraction | Extraction | None |
| Extrusive luxation of permanent teeth | Reposition the tooth. Flexible splinting for 7 to 10 days.<br>In case of pulp necrosis do endodontic treatment. | Reposition the tooth. Flexible splint (using available materials e.g. manila, fishing line or iron wire) for 7 to 10 days. In case of pulp necrosis do endodontic treatment. | Lack of thin wire, plastic string and composite |

* References (12-15)

Table 2c; Recommended treatment for avulsion, alveolar fractures and soft tissue injuries

| Injury | Recommended management in Western Countries* | Management recommended for Tanzania | Limitations/constraints |
|---|---|---|---|
| Avulsion of deciduous teeth | No treatment is required and re-plantation is contraindicated. | No treatment is required and re-plantation is contraindicated. | None |
| Avulsion of permanent teeth are | Information to teachers and parents: | Create awareness both among professionals and general public. | Dental professionals not conversant with steps involved in the management of avulsed teeth. |
| | Get the tooth; hold it on the crown. Do not touch the root; put it back in the socket. If the tooth has fallen down in dirty, clean it with milk or normal saline. | | |
| | Otherwise, put a tooth in a glass of milk or normal saline or into the child/parent s vestibule and go to a dentist. | Recommended transport media: Child/parent s vestibule, normal saline or child s saliva | The general public is not informed on possible treatment measures of avulsed teeth. |
| | At the dental clinic<br>Replant the tooth; apply a flexible splint for 7 to 10 days. Teeth with closed apex - do endodontic treatment after one week. | At the dental clinic<br>Replant the tooth; apply a flexible splint (using available material) for 7 to 10 days. | |
| | | Teeth with closed apex - do endodontic treatment after one week. | Milk is not readily available |
| | Teeth with open apex - follow up the patient. In case of pulp necrosis do apexification. | Teeth with open apex - follow up the patient. In case of pulp necrosis do apexification. | Lack of thin wire and, plastic string. |
| Alveolar fracture | Refer the patient to oral surgery department | Re-position a fractured fragment, apply a rigid splint and stitch the wound | No oral-surgeons upcountry |
| Soft tissue injuries | Clean the wound. Stitch when necessary. Advise good oral hygiene | Clean the wound. Stitch when necessary. Advise good oral hygiene | None |

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# Chapter 6

## The effect of a consensus statement on initial treatment choice for traumatic dental injuries

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### Abstract

The aim of this study was to investigate the influence of a consensus statement on dental practitioners' choice of initial treatment for traumatic dental injuries. Dental practitioners working at government dental clinics in eight cluster sample regions of mainland Tanzania were requested to participate in the study. That is, to record the treatment they provided to children aged 1-17 years seeking dental consultation after injury for a period of twelve months. Six months after the beginning of data collection, a consensus statement was introduced. After the dental practitioners received the consensus statement the correct treatment they provided increased from 51% to 57%. The unnecessary treatments increased from 54% to 59% while wrong treatments decreased from 55% to 42%. Only a small improvement was observed in the percentage of correct treatment, but there was a slightly significant improvement in the percentage of wrong treatments provided before and after introduction of the consensus statement. We conclude that the consensus statement influenced slightly the dental practitioners' choice of initial treatment for dental trauma in the desired direction.

### Introduction

Traumatic dental injuries are common among children and adolescents (1). Despite this fact, dental injuries represent one of the few situations where dentists are called upon to make unscheduled diagnostic and treatment decisions in an area that is outside their routine experience (2). In principle, the future dental health of a patient who has sustained a dental injury depends among others on the knowledge and skills and the actions taken by the dentist involved (3-4). Accordingly, a considerable number of investigations on dentists' knowledge to treat dental trauma would be expected. Unfortunately, only a few have been published. A study conducted in England by Hamilton et al (3) reported that dentists providing primary care have insufficient knowledge to treat dental trauma. Therefore they proposed a measure for improvement of dental practitioner's

knowledge by offering postgraduate training or provision of in-service training. In Tanzania, Kahabuka et al (5), observed that equal proportions of practitioners, about one-third each, reported correct, unnecessary and wrong treatment options. The authors recommended that efforts should be made to improve and standardise treatment methods for dental trauma.

In recognition of the general dental practitioners role in treatment of dental trauma, we staged a consensus conference to discuss the treatment of dental trauma advocated in Western countries and proposed treatments feasible in Tanzania. After the conference, we distributed the consensus statement to all dental practitioners as guidelines for treatment of dental trauma in the country (6). The aim of this study was to investigate the influence of the consensus statement on dental practitioners choice of initial treatment for traumatic dental injuries.

## Subjects and Methods

### Subjects

In Tanzania mainland there are 20 administrative provinces (regions) constituted by several districts. In each region, there is a dental clinic at each regional hospital and at each district hospital. Three different cadres; Dentists (DDS), Assistant Dental Officers (ADO) and Dental Therapists (DTh), in decreasing level of training provide dental care. Dental therapists have four years of secondary school education plus three years of training to become dental therapists. Assistant dental officers are dental therapists who had worked in the field for a minimum of three years and had attended a two years upgrading course to become ADO. Dentists are university qualified dental practitioners with five years of undergraduate training plus one year of internship. At a regional clinic, a DDS an ADO and several DTh are employed, while at district clinics, usually a DTh and occasionally an ADO are employed depending on the size of the clinic. There are no maxillofacial surgeons at the regional or district dental clinics. Eight regions were selected to take part in the study on cluster sample basis. There are 40 government dental clinics in the 8 cluster regions. All clinics were invited to take part in the study. Participation or response was from 27 clinics (67.5%). Eight dental clinics were excluded due to too few patients attending (less than two patients in a period) either before or after distribution of the consensus statement leaving data from 19 clinics for detailed evaluation.

### Methods

In the current study, we assessed dental practitioners management for dental trauma. One investigator (FKK) visited the dental practitioners at their working

stations and motivated them to participate in the study. The investigator presented to each dental clinic, a form adopted from a previous study (5). The form listed 21 types of injuries according to Andreasen s classification (1) and presented 19 treatment choices. The treatment choices include; observation, selective grinding, reattachment of a fractured tooth fragment and buildup with composite or buildup with glass ionomer cement. Other choices were; pulp capping, pulp amputation, root canal treatment, extraction, repositioning the tooth and replanting the tooth. Others were, flexible splinting, rigid splinting, prosthesis, cleaning, stitching, antibiotics and refer.

The practitioners were requested to record on the forms, the child s age and gender, and to tick off the treatment they provided to various oro-dental injuries whenever children aged 1-17 years sought dental consultation at their dental clinics after injury. For each patient, practitioners could provide more than one treatment for one injury as would deem necessary. A consensus statement on the management of dental trauma (6) was introduced six months after the beginning of data collection. The data was collected for one year, that is, six months before and six months after the introduction of the consensus statement so as to allow comparison of treatments provided during the two periods.

During data analysis, we categorised the treatment modalities for the various types of injuries as correct (treatment that has to be done at first visit), unnecessary (treatment that should not necessarily be done at first visit but may be necessary at follow-up visits or in case of complications) and wrong (treatment that should not be done), based on recommendations of Andreasen (1), McTigue (7) and The American Association of Endodontics (8). The treatment choice refer was considered correct throughout. For example, in case of enamel-dentine fracture with pulp exposure (complicated enamel-dentine fracture), we considered correct treatment to be refer, pulp capping, pulp amputation, reattachment of fragment, and build up with composite or with Glass Ionomer Cement. Unnecessary treatments were root canal treatment and extraction, whereas wrong treatments were the remaining eleven treatment alternatives.

The results were expressed as frequency distribution and computed in percentages. The denominator used in calculating the percentage of treatment provided was the number of teeth rather than the number of children. Therefore, if a child had sustained more than one type of injury, the treatment provided to each tooth was counted independently. The paired t-test was employed to test the differences between the two periods (before/after consensus). $P<0.05$ was chosen as the level of significance.

## Results

A total of 422 patients with oro-dental trauma were treated at 19 dental clinics. Most of them had sustained either luxation injuries (37%) or injury to hard dental structures (34%) (table 1). The percentage of children with dental injuries (62%) seen in the second period (after distribution of the consensus statement) was higher than that seen in the pre-conference period (38%) but the distribution of the injuries treated was similar in both periods.

Table 1. Distribution of different types of injuries seen at 19 dental clinics

| Type of injury | Before consensus | | After consensus | | Total | |
|---|---|---|---|---|---|---|
| | n | (%) | n | (%) | n | (%) |
| Luxations | 57 | (35) | 99 | (38) | 156 | (37) |
| Injury to hard dental structures | 56 | (35) | 89 | (34) | 145 | (34) |
| Soft tissue injuries | 24 | (15) | 31 | (12) | 55 | (13) |
| Avulsion | 18 | (11) | 31 | (12) | 49 | (12) |
| Alveolar fracture | 7 | (4) | 10 | (4) | 17 | (4) |
| Total | 162 | | 260 | | 422 | |

A small, non-significant improvement was observed in the percentage of correct treatment after the introduction of the consensus statement. With 51% correct treatment given before while 57% were given after introduction of consensus statement, showing an improvement of 6%. Before the consensus statement, 54% unnecessary treatments were given and 59% were given after obtaining the consensus statement, which is a non-significant decline of 5%. A slightly significant improvement ( p=0.04) was observed in the percentage of wrong treatments whereby 55% wrong treatment were provided before and 42% were provided after introdusing the consensus statement, which is an improvement of 13% (table 2).

Table 2. Percentage of the treatments correct, unnecessary and wrong before and after the consensus statement

| | Before consensus | After consensus | Improvement |
|---|---|---|---|
| Correct | 51% | 57% | 6% SE = 5.8 |
| Unnecessary | 54% | 59% | -5% SE = 8.5 |
| Wrong | 55% | 42% | 13% SE = 6.2 |

The percentages of correct, unnecessary and wrong treatments provided by DDS and DTh improved after obtaining the consensus statement, but for the ADOs there was a decline for correct treatments (64% to 56%) and unnecessary treatments (57% to 87%) (Table 3). However, the differences were not significant.

The highest percentage in each of the three categories correct , unnecessary and wrong treatments were given to soft tissue injuries (86%), alveolar fractures (71%) and luxation injuries (51%) respectively. With the exception of treatment given to luxation injuries, the percentage of correct treatment given in the other injuries increased after the consensus statement was introduced, but the increase was not significant.

The percentage of unnecessary treatment decreased for soft tissue injuries, luxations and injuries to hard dental structures but increased for avulsion and alveolar fracture. These changes were not significant. After the introduction of the consensus statement, the percentage of wrong treatments given decreased significantly ($p = 0.002$) for all types of injuries (table 4).

Table 3. Percentage of treatment provided at different clinics where DDS, ADO and DTh are employed before and after the consensus statement assessed as correct, unnecessary and wrong.

| | Before consensus % | After consensus % |
|---|---|---|
| DTh | | |
| Correct | 47 | 59 |
| Unnecessary | 57 | 51 |
| Wrong | 47 | 29 |
| ADO | | |
| Correct | 64 | 56 |
| Unnecessary | 57 | 87 |
| Wrong | 75 | 66 |
| DDS | | |
| Correct | 46 | 59 |
| Unnecessary | 57 | 44 |
| Wrong | 46 | 33 |

Table 4. Treatment options provided before and after the consensus statement to various types of injuries assessed as correct, unnecessary and wrong

| | Before consensus | | | After consensus | | |
|---|---|---|---|---|---|---|
| | % correct | % unnecessary | % wrong | % correct | % unnecessary | % wrong |
| Soft tissue injuries | 79 | 75 | 63 | 90 | 45 | 26 |
| Luxation injuries | 46 | 63 | 56 | 46 | 55 | 48 |
| Injuries to hard dental structures | 41 | 41 | 48 | 58 | 28 | 36 |
| Avulsion | 33 | 56 | 61 | 36 | 58 | 42 |
| Alveolar fracture | 43 | 43 | 57 | 70 | 90 | 30 |

## Discussion

The eight cluster regions were selected to allow representation of the whole country by choosing a region from each geographical corner. Two regions are located in the central part, two in the north, and one each in the east, northeast, south and southwest.

Due to lack of maxillofacial surgeons to work in upcountry dental clinics, initially general dental practitioners deal with all oro-dental injuries. When necessary, patients requiring attention of a maxillofacial surgeon are referred to the Faculty of Dentistry. This explains why a considerable number of patients treated in this study had sustained injury to soft tissues. The treatments reported were provided by three cadres of dental practitioners, DDS, ADO and DTh, whose level of training may influence their treatment choice. Before the consensus statement was distributed, ADOs provided the highest percentage (64%) of correct treatment than the other two cadres. Probably, it is because the ADOs have practiced before attending an upgrading course, therefore they are likely to concentrate their learning on the challenges they faced during practice. Dental trauma might be one of these challenges. However, unlike for DDS and DTh, the correct treatment provided by ADOs decreased after obtaining the consensus statement. The ADOs seemed to be more conscious about the treatment modalities. This overconciousness might have resulted in overdoing, that is, providing more unnecessary treatments.

After the dental practitioners received the consensus statement, their choice of treatment improved slightly as reflected by the increased percentages of correct treatment and decreased percentages of unnecessary and wrong treatment both

in general and on individual injuries. The improvement was only slight probably due two reasons. First, clinical guidelines are only one option for improving the quality of care as reported by Woolf (9). Patient factors as well as individual practitioner s willingness to change need to be addressed alongside improvement of the dental practitioner s knowledge in order to achieve a substantial improvement. Patient factors include; post dental experiences, expectations, emotional resources and relative values, personal factors (10-12), and poor patient s attendance pattern (13). The second reason could be premature evaluation, which was reported by Freemantle (14), as a methodological weakness in professional behaviour change intervention. In this study, evaluation was initiated immediately after the practitioners received the guidelines. On a long term, more improvement is anticipated.

It has been observed also that general dental practitioners see only a few cases of dental trauma each year, which would not provide sufficient experience to develop and maintain their clinical skills (3). Therefore Hamilton (3) proposed that for all but the most minor injuries there is a need to develop and test specialist centres to which children could be referred from the primary sectors. In another study, computer-assisted learning (CAL), was used to educate general dental practitioners on the management of traumatised incisors (15). In the current Tanzanian situation these approaches are not feasible due to resource limitations. For instance only a few dentists have access to PCs.

W e conclude that the consensus statement provided to dental practitioners improved slightly their choice of initial treatment for dental trauma. Therefore, it is recommended first to organise repeated or follow up motivation contacts with the dental practitioners so that they will refer to the consensus statement whenever a patient who had sustained an oral dental injury seeks consultation at their clinics. Second, to provide in-service training to dental practitioners and to intensify the training of management for dental trauma at dental schools. Third to educate the lay public on the benefits for immediate treatment of dental trauma, correct handling of avulsed teeth, possible treatment modalities as well as prevention of the traumas.

## Acknowledgement

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# Chapter 7

## Influence of seminar and mailed guidelines on school teachers knowledge on emergency treatment for oro-dental injuries

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### Abstract

Objective: To evaluate the influence of two different modes for delivering guidelines on school teachers' knowledge on emergency treatment for oro-dental injuries.

Basic research design: Cross sectional questionnaire study.

Setting: Primary schools.

Participants: Primary school teachers.

Intervention: Provision of guidelines by mail or through seminar or no guidelines (control).

Main outcome measure: Knowledge on emergency management of oro-dental injuries

Results: The teachers did not have adequate knowledge on the emergency management of traumatised teeth. Significant differences were observed between the study groups. Teachers from the seminar group are likely to replant an avulsed tooth (five times more likely than the control group) or otherwise would transport it in the recommended medium. No significant differences were observed between the groups on their willingness to take the avulsed tooth to a doctor or dentist or on the method or liquid they will use to clean a dirty avulsed tooth.

Conclusion: Compared to provision of information through mailed guidelines, seminar discussions better improve school teacher s knowledge on emergency treatment for oro-dental injuries.

### Introduction

Investigations on dental trauma reveal that the lay public does not have adequate knowledge on the management of traumatised teeth (1-5). This information is unfavourable, because at best prompt and appropriate emergency management needs to be started by lay persons prior to the child's initial contact with a dental practitioner (6). Consequently, several authors (1-7) have recommended that

educational campaigns about the management of dental trauma, particularly avulsed teeth, need to be provided to the lay community.

Prior to a study conducted by Moshy et al in 1996 (8), Tanzanian dentists relied on literature from developed countries for issues related to facial injuries. Utilizing hospital data, Moshy (8) observed similar demographic trends of the facial injuries in Tanzania with that in developed countries. Unfortunately, in Tanzania there is no professional information to guide parents, teachers and children on what to do in the event of dental trauma. Hence, it was thought that schoolteachers could play a fundamental role in promoting self-care for children who sustain oro-dental injuries. Preliminarily, investigation on school teachers knowledge about the management of dental trauma was done among 539 randomly selected teachers from each of the three districts of Dar es Salaam. Results of the investigation showed that 34%-67% of the teachers had seen children who had sustained various oral dental injuries. Only 1%, 5% and 20% of the teachers who would replant the avulsed tooth, will transport the avulsed tooth in milk or in saline solution respectively. Thirty three per cent of the teachers reported that they would scrub to clean a dirty avulsed tooth and 22% will not take the avulsed tooth to a doctor or dentist. After a pilot survey, guidelines on what the lay community should do in the event of a dental trauma were distributed to schools or were presented to teachers in a seminar session. The aim of this study was to evaluate the effect of the two modes of delivering the guidelines.

## Subjects and Methods

A list of government owned primary schools was obtained from the Dar es Salaam city council (n= 180). On this list, names of schools and number of teachers at each school were indicated. Dar es Salaam is comprised of 5,757 teachers in three districts Kinondoni, Temeke and Ilala with 46 per cent, 30 per cent and 24 per cent of the teachers respectively. Primary schools in each district were divided into three study groups; a group from which teachers were invited to attend a seminar (n= 62), a group in which the heads of school were mailed printed guidelines only (n= 58) and a control group that did not receive any guidelines (n= 60).

### A group that received mailed guidelines

Guidelines narrating steps to be taken by a lay public when a child sustains dental injury were prepared in accordance to recommendations by Andreasen (6) and McTigue (9). The guidelines were translated into a National language, Kiswahili

and printed as a brochure (appendix 1). The cover of the brochure displayed a fractured tooth and a caption informing that such a condition can be treated. The brochures were mailed to 64 government owned primary schools, which belonged to the mailed guideline group or missed the seminar. Together with the brochure, was a covering letter requesting the heads of school to convey the information comprised in the brochure to all teachers at their respective schools.

A group that attended a seminar

One hundred twenty four teachers (two teachers from each school; the head of the school and a teacher responsible with health affairs) from 62 primary schools were invited to attend a one-day seminar. One hundred twelve teachers (90%) from 56 schools attended the seminar; six schools that missed the seminar were included in the mailed guidelines group. The seminar (an oral presentation with the aid of transparencies) was conducted at the Faculty of Dentistry by one author (FKK) in two sessions. Each session (with about 60 teachers) lasted around two hours. On registration, each attendant was provided with a copy of the brochure (see above). The facilitator elaborated on the steps to be taken by teachers whenever a child sustains an injury to oro-dental tissues while at school and requested the teachers to disseminate the information to their colleagues. Conduct of the seminar was satisfactory.

Questionnaire

This study utilised the questionnaire, modified from that used in Australia by Raphael and Gregory (1). The questions asked were: Q.1 If a child sustains injury to oro-dental structures, what would be the first place you would contact? Q.2 How urgent will you seek professional help after injury to oro-dental structures? Q.3 Will you replant a knocked out tooth back into the place where it came from? Q.4 If you would not replant the knocked out tooth, how would you transport it to the dentist? Q.5 If the knocked out tooth has fallen on the ground and was covered by dirt, what will you use to clean it with? Q.6 If you will wash the tooth, which liquid will you use? Q.7a-d Do you remember to have seen a child who had sustained the following injury, fractured tooth, loosened tooth, knocked out tooth, or soft tissue injuries? Q.8 Have you ever received advice on what to do in the event of an accident where oro-dental structures are injured? Q.9 If you ever received an advice, who gave that advice? The last two questions were asked in order to evaluate the promotion of information to other teachers by seminar attendants or heads of schools to whom guidelines were mailed.

During the preliminary survey, some teachers were not found at schools either

due to illness, study leave or annual leave. Therefore, during the main study each school was considered to have only three quarters of registered teachers. A random selection of schools was done independently in each district until an approximate number of teachers required in each group was reached. Evaluation of the influence of the two modes of provision of guidelines to schoolteachers was done six months after provision of guidelines. On a survey day, teachers who were present at schools were requested to fill in a self-administered close-ended questionnaire form. Except at three schools out of 25, all the questionnaires were filled and collected on the same day. From the three schools, 68- 73% of the questionnaires were filled. Table 1 presents a total of 655 teachers who participated, showing that a proportional distribution of the participants over the districts and intervention modes was obtained.

The survey was voluntary and confidentiality was assured since names were not required on the questionnaire but respective groups were indicated. The results of the questionnaire were expressed as frequency distribution and computed in percentages. Chi-square test was employed to test the differences between the three study groups. $P<0.05$ was chosen as the level of significance.

Table 1. Distribution of schools and teachers over the study groups and districts in the evaluation study

| | Total | Seminar | Mailed | Control |
|---|---|---|---|---|
| | (n=655) | (n=272) | (n=185) | (n=198) |
| SCHOOLS | | | | |
| Kinondoni | 11 | 4 | 4 | 3 |
| Ilala | 8 | 3 | 3 | 2 |
| Temeke | 6 | 3 | 1 | 2 |
| Total | 25 | 10 | 8 | 7 |
| TEACHERS | | | | |
| Kinondoni | 272 (42%) | 91 | 90 | 91 |
| Ilala | 185 (28%) | 60 | 65 | 60 |
| Temeke | 198 (30%) | 50 | 93 | 55 |
| Total | 655 (100%) | 201 | 248 | 206 |
| | | (31%) | (38%) | (31%) |

## Results

A substantial number of teachers reported to have seen children who had sustained oro-dental injuries, with the percentages being 45% for soft tissue

injuries, 66% for a fractured tooth, 76% for a knocked out tooth and 84% for periodontal tissues injuries. There were no significant differences between the three groups in the number of teachers who had seen children suffering from various oro-dental injuries.

Of the teachers who filled in the questionnaire, 54% indicated that they would send a child who had sustained injury to oro-dental tissues to a nearby dental clinic and 42% would send the child to a nearby hospital. Eighty seven per cent of the teachers reported that they would send the child who had sustained oral injuries immediately for professional consultation, while 12% of the teachers would replant the avulsed tooth (table 2). In comparison to teachers in the other two groups, a highly significant difference ($X^2$ test $P<0.0005$) was observed whereby more teachers from the seminar group (26%) would replant a knocked out tooth compared to 4% from the mailed guidelines group and 6% from the control group. A few teachers (15%) will not take the avulsed tooth to a doctor or dentist (table 2). No significant differences were found between the three groups as to whether the teachers will take the avulsed tooth to a doctor/dentist or not. For the teachers who will take an avulsed tooth to a dentist, only 4% will transport the tooth in milk and 32% will transport the tooth in saline solution. Scrutiny into individual study groups shows that 47% of the teachers in a seminar group will transport avulsed tooth either in milk or saline solution, compared to nearly 38% of teachers in the mailed guidelines and approximately 31% in the control group, (table 3). The difference was highly significant ($X^2$ test $P<0.0005$).
Teachers that would scrub a dirty avulsed tooth to clean it are 24% of the total while those who would use fresh water or saline solution to clean a dirty avulsed tooth are 41% and 57% respectively (table 4). There were no significant differences between the three groups of teachers in the cleaning method or the type of liquid, which they would use to clean a dirty avulsed tooth.
Teachers who reported to have received an advice on what to do in the event of oral trauma amounted to 59%. Most of them (22%) reported to have received such an advice from a dentist. More teachers from the seminar group (71%) reported to have received an advice on what to do in the event of injury to oral tissues than teachers from the mailed guidelines group (58%) or control group (50%). This difference was highly significant, ($X^2$ test $P<0.0005$). Similarly, a highly significant difference ($X^2$ test $P<0.0005$) was observed between teachers from the seminar group (29%) who reported to have received an advice from their colleagues as compared to 8% and 7% for the mailed guidelines and control group respectively.

Table 2. Percentage of school teachers reporting various actions they would take when a child sustains a dental injury

| | | Total | Seminar | Mailed | Control |
|---|---|---|---|---|---|
| Urgency of seeking professional consultation after an oral-dental injury | | (n=653) | (n=199) | (n=248) | (n= 206) |
| | n | % | % | % | % |
| Immediately | 572 | 87 | 82 | 89 | 91 |
| W ithin 30 minutes | 30 | 5 | 9 | 3 | 3 |
| Postponed (later than 30 minutes) | 51 | 8 | 9 | 8 | 6 |
| W illingness to replant a knocked out tooth | | (n=646) | (n=199) | (n=243) | (n= 204) |
| | n | % | % | % | % |
| Yes | 74 | 12 | 26 | 4 | 6 |
| No | 572 | 88 | 74 | 96 | 94 |
| W illingness to take an avulsed tooth to a doctor or dentist | | (n=652) | (n=199) | (n=247) | (n= 206) |
| | n | % | % | % | % |
| Yes | 556 | 85 | 87 | 88 | 80 |
| No | 96 | 15 | 13 | 12 | 20 |

Table 3. Different media that would be used by respondents to transport an avulsed tooth

| | | Total | Seminar | Mailed | Control |
|---|---|---|---|---|---|
| | | (n=556) | (n=174) | (n=217) | (n=165) |
| | n | % | % | % | % |
| In a container with milk | 23 | 4 | 11 | 1 | 2 |
| In a container with salty water | 181 | 32 | 36 | 32 | 29 |
| W rapped in a plastic bag | 53 | 10 | 7 | 10 | 12 |
| In a container with tap water or juice | 14 | 3 | 0 | 3 | 5 |
| W rapped in a paper | 245 | 44 | 42 | 44 | 45 |
| Do not know/Others | 40 | 7 | 4 | 10 | 7 |

Table 4. Liquids that would be used by respondents to clean an avulsed tooth

| | | Total (n=634) | Seminar (n=195) | Mailed (n=239) | Control (n= 200) |
|---|---|---|---|---|---|
| | n | % | % | % | % |
| Milk | 15 | 2 | 5 | 1 | 1 |
| Saline solution | 359 | 57 | 60 | 58 | 53 |
| Fresh water or juice | 260 | 41 | 35 | 41 | 46 |

## Discussion

Although the information collected in a pilot survey has not been published, it is referred to in this study as preliminary information.

The current observation that a substantial number of teachers have seen a child who had sustained oral-dental injuries supports an earlier remark (10), that oral injuries are common among children in Tanzania. Responses for a few questions did not show any statistical significant differences between the three study groups. First, is a report of the teachers to have seen children who suffered different types of trauma. Basically, guidelines were not expected to influence this behaviour. The other three responses namely, a method for cleaning of a dirty avulsed tooth, a liquid to be used in cleaning and lack of willingness to take an avulsed tooth to a dentist or doctor were expected to change. Absence of change may imply a need of emphasis or modification in education strategies.

Teachers from the seminar group are likely to replant an avulsed tooth (five times more likely than the control group) or otherwise would transport it in the recommended medium despite the fact that milk is not readily available. Since 32% of the teachers would transport the avulsed tooth in a salty solution, a reliable approach to promote correct transport of an avulsed tooth to a dentist will be to instruct the teachers/lay community on how to prepare a saline solution.

More teachers in a seminar group reported to have received an advice on what to do in the event of injury to oral tissues from their colleagues than teachers in the mailed guidelines or control group. These findings propound that seminars would be a good mode of providing correct information when compared to provision of guidelines by mail.

The current study shows that the school teachers have inadequate knowledge on the management of traumatised teeth, similar to what has been reported in previous studies (1-5). As children spend more time at schools it means that teachers with inadequate knowledge will provide inappropriate initial management

to children who sustain dental trauma at school. This is particularly true on the method of cleaning the avulsed tooth, the transport media for an avulsed tooth and the need to take an avulsed tooth to the dentist or doctor. The lack of appropriate knowledge and skills also presents lost opportunities for saving or preserving teeth, which would have a probability of being replanted.

Compared to findings of other studies, fewer teachers in the current study (4 %) would transport the avulsed tooth in milk. The percentages in other studies ranged from 4.5 to 10. Fewer teachers in the current study (45%) would send a child to a Dentist and also fewer (11%) were willing to replant an avulsed tooth compared to 62.5% and 62% respectively as was reported by Raphael & Gregory (1). The social consequence of this practice is that children would have missing anterior teeth, which will cause a social stigma when smiling or talking. Social stigma associated with missing anterior teeth may necessitate demand for dentures at an early age.

The findings of this study correlate well with those of other studies in that the lay community has inadequate knowledge on the management of avulsed teeth. The results show that provision of information through seminar discussions improve school teacher s knowledge on measures to be taken in the event of oro-dental injuries better than through the mailed guidelines. It is recommended that first, a topic about handling of traumatised teeth be incorporated in the school teachers training curriculum. Secondly, that more seminars be organised for a wider coverage so as to create awareness to a larger Tanzanian population regarding measures to be taken in the event of oral injury.

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# Chapter 8

## The effect of a single educational input given to school teachers on patient's correct handling after dentel trauma

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### Abstract

The aim of this study was to evaluate the influence of mailed guidelines and seminars to school teachers on self-care actions taken by children after trauma. Data was collected six months before and five months after provision of the guidelines. Particulars of school children who sought dental consultation, types of injuries, the medium used to store avulsed teeth and the time elapsed from injury to dental consultation were recorded. A non-significant increase was observed in a number of children who sustained tooth avulsion from primary schools that belonged to a seminar group and from nursery schools that belonged to a mailed guidelines group. There were no significant differences before and after provision of guidelines in the number of patients with soft tissue injury, periodontal injury and injury to hard dental structures. Of the patients who sustained tooth avulsion, 36 (54%) brought the involved tooth to the dental clinic, (29%) sought dental consultation later than seven hours after injury. None of those patients stored the avulsed tooth in a recommended transport medium. The findings of this study indicate that a single educational input to schoolteachers is not enough to promote children's self-care after injury.

### Introduction

In order to achieve a long-term success in the management of traumatised teeth, treatment should be done as soon as possible after injury (Andreasen and Andreasen, 1994). In this respect, the lay community may play an important role especially when dealing with avulsed teeth since immediate replantation is generally accepted as the treatment of choice for an avulsed tooth (Andreasen et al, 1994, McTigue, 1994, Am Assoc Endo, 1995). Thus prompt and appropriate emergency management preferably is to be provided by lay people prior to the child's initial contact with a dental practitioner. Furthermore, if replantation is to be done by a dental practitioner, it is essential for the lay community to know the appropriate storage medium recommended; Hank's balanced salt solution

(HBSS), milk, saline, saliva (buccal vestibule) or water as a last resort (Andreasen et al, 1994, Am Assoc Endo, 1995).

In many countries, primary school teachers provide oral health education to children (Bartlett, 1981, Kolbe, Tolsma, Dhillon et al, 1992, Nyandindi, Palin-Palokas, Milen et al, 1994), particularly so where dental personnel is scarce (Hubley, 1988). Because traumatic dental injuries are common among children (Andreasen et al, 1994) and most of the injuries occur at schools (Onetto, Flores, and Galbarino, 1994, Schatz and Joho, 1994), schoolteachers may play an important role to guide children's care following traumatic dental injuries. In a series of investigations for traumatic dental injuries among Tanzanian children, guidelines narrating the steps to be taken when a child sustains oral injury were prepared and distributed to schoolteachers. The guidelines were given either as a mailed brochure to heads of schools or two teachers from selected schools were invited to attend a one-day seminar and were given a brochure. We anticipated that when schoolteachers have acquired the required information on correct handling of oral injuries, they would guide the children to take correct actions. Therefore, the aim of this study was to evaluate the influence of the guidelines (seminar or brochure) given to school teachers on actions taken by children after trauma.

## Subjects and Methods

### Subjects

A list of nursery and primary government schools was obtained from the Dar es Salaam city council, that of private schools was obtained by interviewing 23 residents from the three districts of Dar es Salaam. Ultimately, 270 schools (97 nursery and 173 primary) were registered to take part in the study. The schools were randomly assigned to three intervention modes; a group from which teachers were invited to attend a seminar (n= 89), a group in which the heads of school were mailed printed guidelines (brochure) only (n= 88) and a control group that did not receive any guidelines (n= 93). Two teachers from each of the seminar schools were invited to attend a one-day course. From 78 schools, 156 teachers (88%) attended the seminar,11 schools missed the seminar and received the brochure. The brochures were either delivered or posted through the District Education Officers to 88 schools that belonged to the mailed guideline group or missed the seminar (n=11).

### Methods

It was intended to evaluate the intervention modes in 11 hospitals/dental clinics in Dar es Salaam that serve at least 90% of the population. The clinics included one

paediatric dentistry clinic at the Faculty of Dentistry, four district dental clinics and six private hospitals or clinics. Dental practitioners at one district clinic did not co-operate therefore their clinic was excluded from the study. The practitioners working at the 10-hospitals/or dental clinics were requested to fill in a clinical summary form whenever a patient aged 3-17 years who had sustained an oro-dental injury sought dental consultation at their clinics. Information to be recorded was the name of school attended by the child and the type of injury sustained. In case of an avulsed tooth also required were, the dentition affected (deciduous or permanent), the medium used to store the avulsed tooth (in case the tooth was presented), and the time elapsed from injury to dental consultation. The study period was 11 months, six months before and five months after provision of guidelines to schoolteachers during which time, 190 patients were treated.

The influence of guidelines on teachers and children s behaviour on self-care after trauma was to be evaluated as changes from baseline situation in four outcome variables: the number of school children who seek dental consultation followirg a traumatic dental injury, the type of injuries presented for dental consultation, the media used to store avulsed teeth and the time lapse from injury to seeking dental consultation. A control group was employed both before and after provision of the guidelines to ascertain whether there were seasonal or community characteristic that might influence the variables under investigation.

Data were analysed by chi-square test and Fisher s exact test. $P<0.05$ was chosen as the level of significance.

## Results

More than 60% of the 190 children who were treated in the current study, had sustained soft tissue injuries and 67 children (35%) had sustained tooth avulsion (table 1). Of the 67 patients who had sustained tooth avulsion, 30 (45%) sustained injury to the deciduous dentition and 37 (55%) to the permanent dentition. Only 36 (54%) of them brought the involved tooth to the dental clinic, but none of those patients stored the avulsed tooth in a recommended transport medium. Information on the time lapse before seeking dental consultation was available in about 50% of those who sustained tooth avulsion, whereby, 19% sought dental consultation 1-6 hours after injury while 29% did so, later than seven hours after injury.

Table 1: Injuries seen at ten dental clinics among 190 treated children

| Type of injury | Before guidelines (n=103) | After guidelines (n = 87) | Total (n = 190) |
|---|---|---|---|
| Soft tissue injury | 68 (66%) | 56 (64%) | 124 |
| Injury to periodontal tissues (luxations) | 53 (51%) | 51 (57%) | 104 |
| Injury to hard dental structures (fractures) | 48 (47%) | 24 (28%) | 72 |
| Avulsion | 32 (31%) | 35 (40%) | 67 |
| Jaw fracture | 1 (1%) | 8 (9%) | 9 |

Distribution of the treated children into the three modes of intervention shows that there are no changes over time in the composition according to intervention modes (table 2). Out of the 190 children, 103 (54%) were treated before provision of guidelines, an average of 17.2 (SE=1.7) patients per month while after provision of guideline 87 (46%) children were treated, which is an average of 17.4 (SE=1.7) patients per month.

Before provision of guidelines, a mean of 2.5 and 2.8 avulsed teeth were attended among nursery and primary school children respectively. The number increased to 3.2 and 3.8 after provision of guidelines (table 3).

More children who had sustained tooth avulsion from primary schools that belonged to a seminar group and from nursery schools that belonged to a mailed guidelines group sought dental consultation after the guidelines than before the guidelines. However, this difference was not significant. Similarly, there was no significant differences before and after provision of guidelines in the number of patients seeking dental consultation after sustaining soft tissue injuries, injury to hard dental structures (fractures) and injury to tooth supporting structures (luxations).

## Discussion

The prevalence of dental trauma has been reported to vary in different seasons depending on the activities which children engage in during the respective seasons (Meadow, Needleman and Lindner, 1984, Oikarinen and Kassila, 1987, Ravn, 1974). Because no significant differences were observed before and after the guidelines in the studied variables among children from the control group, it is presumed that the results of this study were not influenced by variations in seasons or community characteristics.

Table 2. Number and percentage of children treated before and after distribution of guidelines by school type and intervention mode

| | Before guidelines (%) | After guidelines | (%) Total |
|---|---|---|---|
| School | | | |
| Nursery | 38 (51%) | 36 (49%) | 74 |
| Primary | 65 (56%) | 51 (44%) | 116 |
| Intervention | | | |
| Control | 43 (54%) | 37 (46%) | 80 |
| Mailed | 31 (55%) | 25 (45%) | 56 |
| Seminar | 29 (54%) | 25 (46%) | 54 |
| TOTAL | 103 (54%) | 87 (46%) | 190 |

Table 3. Mean number of tooth avulsion treated per month before and after the guidelines by intervention groups and school type

| | Before the guidelines | After the guidelines |
|---|---|---|
| Nursery school | | |
| Control | 1.2 | 1.2 |
| Mailed guidelines | 0.8 | 1.4 |
| Seminar | 0.5 | 0.6 |
| Primary school | | |
| Control | 1.0 | 1.0 |
| Mailed guidelines | 1.0 | 0.8 |
| Seminar | 0.8 | 2.0 |
| Total | 6.3 | 7.0 |

The current study was designed with expectations that, after provision of guidelines there would be an increase in the number of school children who seek dental consultation after sustaining a traumatic dental injury (particularly those who sustain tooth fractures or tooth avulsion). A non-significant increase was observed only among children who sustained tooth avulsion of permanent teeth from schools that belonged to a seminar group (or those who sustained avulsion of deciduous teeth from nursery schools that belonged to a mailed guidelines group). The knowledge acquired from the guidelines might have influenced this observation.

Secondly, it was anticipated that children who sustain tooth avulsion will bring with them the avulsed teeth stored in one of the recommended transport media

and that they will seek dental consultation immediately after injury. None of these anticipations was observed. Consequently, implantation of the avulsed permanent teeth would not have been successful despite the efforts to seek dental consultation by a substantial number of children (37) who had sustained avulsion of the permanent dentition.

There may be several explanations for the findings of the current study. First, provision of knowledge alone in a single educational input as was done in this study may not be enough to influence behaviour. Second, since children were not directly addressed, most likely they were not motivated to report to their teachers immediately after injury. Those who sustained avulsion may not have picked up the tooth since they were not informed, or they may have given it a wrong handling before seeking help from their teachers. Finally, it was probably farfetched to expect schoolteachers alone without parental involvement, to play an important role in promoting children's self-care when they sustain dental injuries. Presumably a better outcome may be expected when an approach is changed to a joint programme to involve parents, teachers and children simultaneously. As it was advocated earlier on (Raphael, 1990, Stokes, 1992, Sae-Lim, 1999), there is a need for educational campaigns aimed at members of the lay public to increase their knowledge of the emergency procedures to be undertaken when a tooth is avulsed.

The findings of this study indicate that a single educational input to schoolteachers is not enough to promote children's self-care after injury. It is proposed that an educational campaign on the emergency treatment for oro-dental injuries should be organised to cover a large sample of teachers, parents and children in order to achieve the desired outcome.

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# Chapter 9

## Discussion

The aims of this study were, first to investigate the occurrence and management of dental trauma among children and adolescents in Tanzania. Second, to develop feasible treatment modalities for traumatic dental injuries (consensus statement) in Tanzania, distribute the consensus statement to dental practitioners and evaluate the effect of the consensus statement on dental practitioners' choice of treatment. Third, to evaluate the influence of guidelines explaining the steps to be taken when a child sustains an oral injury on the actions taken by schoolteachers and children. In the following paragraphs, the relevance of the study, some methodological aspects and the results are discussed.

### Relevance of the study

Tanzania is 945,090 sq km in size with about 30 million inhabitants. Children aged 0-4 years form 17% of the total population, 5-14 years form 30% and above 15 years form 53%. About 47% of the children aged 6-15 years are enrolled to primary schools. The life expectancy of Tanzanians is 50 years. Maternal mortality rate is 1.04 per 1,000 women years of exposure, infant mortality rate is 87.5 per 1,000 live births and less than five mortality is 136.5 per 1,000 live births (1).

Oral health is one of the components of primary health care listed by the Tanzanian Ministry of Health. The DMF-T in the permanent dentition is 0.48-0.67 among 12 year olds (2-3), ranges from 0.7 to 1.3 among 18 year olds, and 1.9 to 2.7 among 35-44 year olds (4). Plaque, calculus and gingivitis affect 93-99.6%, 66-95.7% and 79-93.8% of the adult population respectively (5-6). About two thirds of the child population have soft deposits and dental calculus, while gingivitis is reported in almost all children (7-9). In a period between 1979 and 1985, about 34% of 600 patients admitted at a University teaching hospital had different types of carcinoma of the oral cavity (10). Rampant caries is reported to affect 6.8% to 10.6% of children aged 1 to 4 years (11-12). Hospital records show that most maxillo-mandibular fractures occur more often in the age group 21-30 years and that males are more affected than females at the ratio of 3:1 (13). While information on two common dental diseases is available, there is no published information on dental trauma in Tanzania, therefore this study was planned to investigate the occurrence and management of dental trauma.

Methodology

A cross section design was employed to study the prevalence and management of dental trauma among children in Tanzania. Whereas a follow-up design was employed to study the influence of a consensus statement on dental practitioner s choice of treatment for dental trauma. Likewise, a follow-up design was used to study the influence of guidelines on the knowledge of schoolteachers on the management of dental trauma and actions taken by school children in the event of dental trauma.

Oral examination for untreated dental trauma was done in a classroom utilizing natural daylight via a window reflected through a plane mouth mirror, with children seated on an office chair. In earlier studies where examination of dental trauma among children was done at schools, the source of light was, a spot head light (14), a portable light (15) or a portable dental chair (16). The source of light used in the current study may result into over- or under- estimation of the problem. Nevertheless, it was the only feasible method due to resource limitations.

Regarding the management of dental trauma, questionnaires inquiring on initial treatment of dental trauma were mailed to 188 dental practitioners and were returned by 138. This response rate of 73% is an indication that dental personnel in Tanzania are co-operative when requested to fill in questionnaires. In addition, hospital records of 130 dental trauma patients treated at the Faculty of Dentistry were retrieved to assess the management of dental trauma. The records lacked some information such as causes of injury and information on follow-up visits. Nevertheless, they furnished useful background knowledge.

In response to the results of the prevalence studies, a consensus conference was conducted to discuss feasible management of dental trauma in Tanzania. Conference participants developed a consensus statement aiming at promoting the dental practitioners  choice of treatment for dental trauma. Although it was the first consensus conference in the country, it was successful. A consensus statement was mailed to all dental practitioners in Tanzania as a guideline (17). According to Littlejohns (18), a good guideline should be valid, reproducible and reliable. That is, (i) a guideline, when implemented, will lead to the outcomes that it was intended to achieve; (ii) given the same data, other guideline producers will offer the same recommendations; and (iii) guideline users will interpret the recommendations in the same way. A consensus statement in this study, was prepared by

representatives of the profession thus most biases were minimized. Furthermore, Morgan (19) reported that in studies where professionals are required to change their behaviour, assessment of professional opinion is concerned at the implementation stage with identifying the factors that lead to compliant or non-compliant behaviours. Professional opinion was addressed in this study by inquiring on the dental practitioners willingness to use the consensus statement (provide treatment as recommended in the statement) or reasons for unwillingness. Fifty seven percent of the practitioners responded, all indicated their willingness to use the consensus statement. Moreover, promotion of behaviour change requires motivation (20) and/or financial incentives (21). In this study, one author visited the dental practitioners and motivated them to implement the guidelines. Unfortunately, financial incentive was not feasible; instead each participating dental clinic was supplied with a package of chemical composite.

Finally, guidelines on steps to be taken by the lay community when a child sustains a dental injury were given to schoolteachers. The schools were grouped into three categories; Group I were schools that were sent the guidelines through post, group II were schools from where two teachers attended a one day seminar and received a printed guideline and group III, a control group of schools that did not receive any guidelines. The schoolteachers addressed in the current study are an organized group. They are relatively easy to reach compared to parents or the community at large. In other countries, public awareness campaigns on the management of avulsed teeth were done through mass media and posters (22-24).
Evaluation of impact of the guidelines was done by comparing the knowledge of the teachers in the three categories. The impact of the guideline was also evaluated by observing among school children that sought dental consultation after injury; changes in the number of children seeking dental consultation, time lapse between injury and dental consultation and presentation of an avulsed tooth stored in a recommended medium.

Results

Twenty one percent of primary school pupils in Dar es Salaam were found to have at least one type of untreated dental trauma. This is comparable to that observed elsewhere (14-15, 25-27). The findings indicate that dental trauma among Tanzanian children may rank third after periodontal diseases which affect 75-99% (7-9) and dental caries which affect 11-20% (28) of the child population. While self-care is feasible with periodontal diseases, the management and prevention of

dental trauma requires professional input. Hence, institution and resource requirement to deal with dental trauma is high. To minimize the cost, the oral health care system needs to direct some aspects of preventive measures against dental trauma.

Looking at the management of dental trauma, general dental practitioners in Tanzania like those in other countries (29), provide few appropriate treatments because they have inadequate knowledge. In Tanzania, equal proportions of dental practitioners about one third each reported to provide correct, unnecessary and wrong treatment options (30). While at the faculty of Dentistry, it was revealed that 31%, 52% and 17% of the injured teeth received correct, wrong and unnecessary treatment respectively (31). Provision of unnecessary treatment is a misuse of resources in terms of time and materials. It could also result into disturbance of patient s aesthetic appearance. Wrong treatments include condemning teeth that would otherwise be saved, misuse of resources as well as disturbance in aesthetic appearance. Thus, measures aiming to provide the general dental practitioners with correct treatment protocols might minimize the inappropriate treatments currently provided.

The conference participants produced a standard protocol on the management of dental trauma, which was adopted nationally (17). After the dental practitioners received the consensus statement, their choice of treatment for dental trauma improved slightly. The correct treatment choices increased from 51% to 57%, unnecessary treatment choices increased from 54% to 59% while wrong treatment choices decreased from 55% to 42%. On a short-term basis, a slight improvement was observed on dental practitioner s choice of appropriate treatment for dental trauma. A bigger impact may be observed after a long term if the recommended treatment protocol will be made part of an official training curriculum, concurrently with conducting continuing education for in service personnel.

In respect to knowledge, lay people (schoolteachers) in Tanzania have inadequate information on the management of dental trauma. This observation is similar to what has been reported in other countries (32-37). In this study, the knowledge was shown to improve reasonably better among teachers from schools that received guidelines on the management of dental trauma, particularly from schools that were represented in a one-day seminar. If in the long run all primary schools in the country will be provided with the guidelines,

about 50% of children aged 6-15 years or 15% of the total population will have a possibility of being informed on correct handling of traumatized teeth.

Steps taken by schoolchildren upon sustaining dental injury were unsatisfactory even after the guidelines were given to schoolteachers. There were no significant differences before and after provision of guidelines in the number of patients who sought dental consultation. Of the patients who sustained tooth avulsion, 36 (54%) brought the involved tooth to the dental clinic, (29%) sought dental consultation later than seven hours after injury. None of the patients stored the avulsed tooth in a recommended transport medium. Considering that guidelines were given at one level (schoolteachers) and evaluation was done at a different level (school children), the observation indicates that information given to schoolteachers is not necessarily disseminated to schoolchildren. In future, it might be promising to give instruction guidelines directly to schoolchildren as part of life saving skills.

General conclusions

1. Although children activities from different countries vary, they seem to cause comparable dental injuries. In this study, dental trauma was found to occur among Tanzanian children at a rate comparable to that reported in industrialized countries.
2. Dental practitioners have inadequate knowledge to treat dental trauma.
3. Not all treatment for oro-dental injuries recommended in Western countries are feasible in Tanzania
4. Consensus statement has the potential of improving the knowledge of Dental practitioners on the treatment of oro-dental injuries
5. Primary school teachers have inadequate information on steps to take in the event of dental trauma
6. Seminar sessions were shown to be a good mode to provide information to school teachers.
7. A single educational input is not sufficient to educate the lay public

Recommendations

The prevalence of dental trauma observed among Tanzanian children pause a challenge for the oral health care system in Tanzania to work out strategies to deal with dental trauma among children. In order to provide more opportunity for treatment of children who have sustained dental injuries, and to improve the treatment outcome for dental trauma, we recommend that;

1. Several upgrading courses or continuing education seminars for dental practitioners should be organised.
2. Guidelines for school teachers should be provided to all schools and a follow-up mechanism be established.
3. Oral health education for parents, children and the lay community at large, aimed at increasing public awareness on home or school based initial management of dental trauma, utilizing mass media should be worked out.
4. Further research is required to document skills and practices of non-dental medical personnel in managing dental trauma at a primary care level.
5. Further studies are needed on management protocols of dental trauma in Tanzania.

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# Summary

Dental trauma constitute true emergencies in dental practice. For this reason, it is essential that general dental practitioners have correct knowledge on the treatment of dental trauma. To support the practitioners knowledge, it is important that the lay community is informed on the steps they have to take in the event of a dental trauma. Nevertheless, both the dental practitioners and the lay community have been reported to have insufficient knowledge or information about the management of dental trauma. Thus, different countries have employed different mechanisms to improve the knowledge of dental practitioners on the management of dental trauma and some have launched campaigns to improve the awareness of dental trauma among the lay community.

In recent years, the pattern of dental diseases in European countries has changed. Consequently, it has been speculated that in the near future dental trauma will probably exceed dental caries and periodontal diseases as the most significant threat to dental health among the youth. Such a speculation is presumably unlikely at the moment in developing countries. Besides, investigation on dental trauma has not been done in depth in these countries. Therefore, the current study on the occurrence and management of traumatic dental injuries in Tanzania (a developing country) was planned, and it was done in two phases. In phase one we established the background information, by performing an examination for untreated dental trauma among children and adolescents and we investigated on the treatment modalities for dental trauma as provided by Tanzanian dental practitioners.

The second phase was an intervention study of the situation observed in the first phase. In this step, we staged a consensus conference where we discussed the treatment of dental trauma, prepared and distributed the consensus statement to all dental practitioners in Tanzania. Thereafter we evaluated the effect of the consensus statement on dental practitioners choice of treatment. Secondly, we prepared guidelines on steps to be taken by the lay community in the event of dental trauma. The guidelines were provided to schoolteachers either by mail to heads of schools or by inviting two teachers from each school to attend a one day seminar and receive a copy of printed guidelines. Later on, we evaluated the effect of these guidelines, first on schoolteachers knowledge and second on the actions taken by school children on seeking dental care in the event of a dental trauma. In chapter 1, the general introduction of the thesis is presented, where the current situation of dental trauma in Tanzania and the objectives of the study are narrated.

The first study, chapter 2 describes the prevalence of teeth with untreated dental trauma among children and adolescents from three districts of different socio-economic status in the Dar es Salaam area. In 21% of 4524 children examined, at least one type of untreated dental trauma was observed. A significant gender influence on the occurrence of untreated dental trauma was observed, with more boys (23%) having untreated dental trauma than girls (19%). A higher percentage of untreated dental traumas was observed among children in the district with highest SES (26%) compared to the prevalence in the other two districts (14%-17%). We concluded that dental traumas are prevalent among Tanzanian children.

Chapter 3 and 4 describe the nature of initial treatment provided by dental practitioners to children aged 1-17 years. The study was done at the University teaching Hospital and at dental clinics in Tanzania mainland. To evaluate the findings, we rated the reported treatments into correct, unnecessary and wrong, based on recommendations advocated in Western countries. The results of the rating of the treatment as reported by dental practitioners working at dental clinics showed that one third of the treatment options were correct, one third were unnecessary and the other third were wrong. The results of the treatment provided at the University teaching Hospital indicated that 31% of the treatment provided were correct, 52% were wrong and 17% were unnecessary

The results presented in chapters 3 and 4 stimulated us to organise a consensus conference to discuss the management of traumatic dental injuries and analyze whether the treatment modalities of traumatic dental injuries recommended in Western countries are feasible in the Tanzanian situation. Chapter 5 therefore, describes the consensus conference that was conducted in Dar es Salaam in February 1998. For most types of injuries, consensus on treatment methods feasible for Tanzania was reached immediately. However, we observed that the recommended management regimes in Western countries for some injuries are not feasible in the current Tanzanian situation. In such a sitution, management feasible in Tanzania were proposed. After the conference, a consensus statement was prepared and distributed to all dental practitioners registered with the Central Oral Health Unit, Tanzania. We concluded that the methods for achieving consensus were useful in the Tanzanian dental situation.

The influence of the consensus statement on the choice of treatment for dental trauma is presented in chapter 6. In this study we evaluated the treatment provided to children who sustain dental injuries before and after the dental

practitioners received a consensus statement. We observed a small, non-significant improvement in the percentage of correct treatment, and a slightly significant improvement in the percentage of wrong treatments provided after the dental practitioners received the consensus statement. Therefore we concluded that the consensus statement influenced slightly the dental practitioners choice of initial treatment for dental trauma in the desired direction.

Chapter 7 describes the influence of the guidelines given to school teachers on their knowledge about steps to be taken in the event of dental trauma. We observed that school teachers do not have adequate knowledge on the emergency management of traumatised teeth. However, their knowledge improved after receiving the guidelines particularly among teachers from schools that were represented in a one day seminar. Thus we concluded that compared to provision of information through mailed guidelines, seminar discussions better improve school teacher s knowledge on emergency treatment for oro-dental injuries.

In chapter 8, the influence of guidelines given to school teachers on steps taken by school children in the event of dental trauma is presented. We observed that of the children who sustained tooth avulsion, 36 (54%) brought the involved tooth to the dental clinic, (29%) sought dental consultation later than seven hours after injury. None of those patients stored the avulsed tooth in a recommended transport medium. A none significant increase was observed in the number of children who sustained tooth avulsion from primary schools that belonged to a seminar group and from nursery schools that belonged to a mailed guidelines group seeking dental consultation after the guidelines. Therefore, we concluded that a sirgle educational input to schoolteachers is not enough to promote children's self-care after injury. Chapter 9 discusses the current situation of dental trauma among youths in Tanzania, the management of the traumas, limitations and suggests probable solutions.

The conclusions of this thesis are narrated in chapter 9.

# Samenvatting

Bij tandheelkundige traumata is er in de tandartspraktijk echt sprake van Eerste Hulp. Daarom is het essentieel dat tandartsen beschikken over de juiste kennis met betrekking tot de behandeling van dergelijke traumata. Het is belangrijk om de kennis van de behandelaar te ondersteunen doordat leken in de samenleving ge nformeerd zijn over stappen die zij zelf kunnen nemen wanneer er sprake is van een tandheelkundig trauma. Niettemin kan er geconstateerd worden dat zowel behandelend tandartsen als burgers in de samenleving onvoldoende ge nformeerd zijn hoe te handelen bij dergelijke traumata. Dientengevolge hebben verschillende landen verschillende mechanismen gebruikt om de kennis van tandartsen over dit onderwerp te verbeteren en sommigen hebben acties op touw gezet om onder de bevolking de bewustwording over gebitsletsels te verbeteren.

Het patroon van tandheelkundige afwijkingen is in de afgelopen jaren in Europese landen veranderd. Als gevolg daarvan wordt verondersteld dat in de nabije toekomst gebitsletsel, als meest bedreigende factor van gebitsgezondheid onder jongeren, tandcari°s en parodontale aandoeningen zal overtreffen. Een dergelijke veronderstelling gaat op dit moment niet op voor ontwikkelingslanden. Bovendien heeft er geen grondig onderzoek in deze landen plaatsgevonden ten aanzien van gebitsletsel. Daarom werd het onderhavige onderzoek naar het v rkomen en de behandeling van gebitsletsels in Tanzania (een ontwikkelingsland) uitgevoerd, en wel in twee fasen. In fase ØØn werd achtergrond informatie verkregen door een onderzoek uit te voeren naar onbehandelde gebitsletsels van kinderen en jonge volwassenen. Tevens werd onderzocht welke behandelingen bij gebitsletsel toegepast worden door Tanzaniaanse tandartsen.
De tweede fase bestond uit een interventiestudie met betrekking tot de in fase ØØn aangetroffen situatie. Een consensus conferentie werd georganiseerd waarin de behandeling van gebitsletsel werd besproken, resulterend in een consensus statement dat verspreid werd onder alle Tanzaniaanse tandartsen. Daarna werd het effect ge°valueerd van het toegestuurde consensus statement op de behandelkeuze van tandartsen. Ten tweede werden richtlijnen opgesteld met betrekking tot de stappen die de leek kan nemen bij het zich eventueel voordoen van een tandletsel. De richtlijnen werden toegstuurd naar de onderwijzers, f per post naar de hoofden van scholen, f door van iedere school twee leraren uit te nodigen een seminar van ØØn dag bij te wonen en ze een kopie te geven van de

in druk verschenen richtlijnen. Later werd het effect ge°valueerd van deze richtlijnen, eerst door de kennis van onderwijzers te meten en vervolgens vast te stellen welke acties kinderen ondernemen bij het zoeken van tandheelkundige hulp in geval van gebitsletsel.

In hoofdstuk 1 wordt een algemene inleiding gegeven op het proefschrift waarin de actuele situatie beschreven wordt met betrekking tot gebitsletsels in Tanzania. Tevens worden de doelstellingen van het onderzoek gegeven.

De eerste studie, hoofdstuk 2, beschrijft de prevalentie van gebitselementen met onbehandelde traumata bij kinderen en adolescenten uit drie districten van verschillende socio-economische status in de regio van Dar es Salaam. In 21% van de 4524 kinderen die onderzocht werden, werd ten minste ØØn type waargenomen van een onbehandeld gebitsletsel. Een statistisch significant geslachts-verschil werd gevonden ten aanzien van gebitsletsels, in die zin dat jongens (23%) meer onbehandelde gebitsletsels hebben dan meisjes (19%). Een hoger percentage onbehandelde gebitsletsels werd aangetroffen bij kinderen in het district met de hoogste SES (26%) in vergelijking tot de prevalentie in de andere twee districten (14-17%). Geconcludeerd wordt dat in Tanzania gebitsletsels voorkomen.

In de hoofdstukken 3 en 4 wordt beschreven wat de initi°le behandeling is die door tandartsen gegeven wordt aan kinderen in de leeftijdscategorie 1-17 jaar. Het onderzoek werd uitgevoerd aan de Universiteitsopleidingskliniek en tandheelkunde klinieken in Tanzania als geheel. Om de gegevens te evalueren werden de vermelde behandelingen gerubriceerd in juist , overbodig en verkeerd , gebaseerd op aanbevelingen zoals die gelden in de Westerse landen. De resultaten van de rubricering van de behandelingen zoals aangegeven door de tandartsen die in de klinieken werken, laten zien dat een derde van de behandelingen als correct, een derde als overbodig en het resterende derde deel als verkeerd werd beoordeeld.
De analyses van de behandelingen aan de universiteitskliniek geven als resultaat dat 31% van de behandelingen correct , 52% verkeerd en 17% als overbodig gerubriceerd werden.
De resultaten die in de hoodstukken 3 en 4 zijn gepresenteerd waren aanleiding om een consensus conferentie te organiseren teneinde te bespreken hoe om te gaan met gebitsletsels en om te analyseren welke behandelmogelijkheden van gebitsletsels die in Westerse landen worden aanbevolen, geschikt zijn voor de situatie in Tanzania. In hoofdstuk 5 wordt vervolgens de consensus conferentie

beschreven die gehouden werd in Dar es Salaam in februari 1998. Voor de meeste soorten letsel werd onmiddelijk consensus bereikt over de behandelmethoden die geschikt zijn voor Tanzania. Echter, vastgesteld werd dat voor sommige letsels de westerse behandelopties niet geschikt zijn, gegeven de huidige situatie in Tanzania. In dergelijke situaties werd een voor Tanzania geschikte oplossing voorgesteld. Na de conferentie werd een consensus verklaring opgesteld en verspreid onder alle tandartsen die geregistreerd zijn bij de Central Oral health Unit in Tanzania. De conclusie werd getrokken dat de methoden om consensus te bereiken geschikt zijn voor de Tanzaniaanse situatie.

De invloed van de consensus verklaring op de behandelkeuze voor tandletsel wordt beschreven in hoofdstuk 6. In deze studie zijn de behandelingen ge°valueerd die gegeven werden aan kinderen v r en na het verstrekken van de consensus verklaring aan de tandartsen. We konden een klein, niet statistisch significant verschil aantonen in de richting van een hoger percentage juiste behandelingen, en een geringe verbetering in het percentage onjuiste behandelingen uitgevoerd door de tandartsen na het ontvangen van de consensus verklaring. Daarom kon geconcludeerd worden dat de consensus verklaring geleid heeft tot een geringe be nvloeding van tandartsen in de keuze van de initi°le behandeling van gebitsletsel in de gewenste richting.

In hoofdstuk 7 wordt beschreven wat de invloed is van het geven van richtlijnen aan onderwijzers op hun kennis met betrekking tot de stappen die te zetten zijn wanneer een gebitsletsel zich voordoet. We hebben vastgesteld dat onderwijzers niet over de juiste kennis beschikken ten aanzien van de onmiddelijk te nemen maatregelen bij het optreden van gebitsletsel. Echter hun kennis nam toe nadat ze de richtlijnen ontvangen hadden, vooral bij hen die deelgenomen hadden aan een seminar van ØØn dag. Derhalve werd geconcludeerd dat, in vergelijking tot het verstrekken van informatie door het opsturen van richtlijnen, de kennis van onderwijzers over spoedhulp bij tandletsel meer toeneemt door seminar discussies.

In hoofdstuk 8 wordt ingegaan op de invloed van richtlijnen die aan onderwijzers worden gegeven over wat er met schoolkinderen moet gebeuren als een gebitsletsel zich voordoet. We hebben geconstateerd dat als bij een ongeluk een tand uitgeslagen wordt, 36 (54%) van de kinderen met de tand naar de kliniek komt en 29% later dan zeven uur na het ongeval de tandarts raadpleegt. Geen van deze pati°nten bewaarde de uitgeslagen tand in het aanbevolen transportmedium. Er was geen significante toename in het aantal kinderen met

uitgeslagen tanden die tandheelkundige hulp zochten na het ontvangen van de richtlijn tussen degenen uit het basisonderwijs van scholen behorend tot een seminar groep en die van peuterscholen die behoorden tot groep die de richtlijn per post hadden ontvangen. Daarom wordt geconcludeerd dat een øønmalige onderwijskundige informatie aan onderwijzers niet genoeg is om de zelfzorg door kinderen na een ongeval te bevorderen.

In hoofdstuk 9 wordt de huidige situatie met betrekking tot gebitsletsel bij de jeugd van Tanzania besproken, alsmede hoe daarmee om te gaan, en wat de beperkingen en voorgestelde mogelijke oplossingen zijn. Het hoofdstuk wordt afgesloten me de conclusies van het proefschrift.

# Curriculum vitae

Febronia Kokulengya Kahabuka was born in Ihangiro, Muleba Tanzania on 16th June 1959. She qualified as Doctor of Dental Surgery (DDS) at the University of Dar es Salaam in 1985. She worked with Prof. Dr. J. D. van Willigen and Prof. Dr. H. s Gravenmade at the University of Groningen in 1987. In a joint programme between the University of Nijmegen and the University of Dar es Salaam, she worked with Prof. Dr. K. G. K nig in 1988 which resulted in an MSc degree of the University of Dar es Salaam, in 1989. Between 1994 and 1996, she had an opportunity to work with Dr Frans Frankenmolen at the unit of child dentistry and Dr W. Willemsen at the Endodontics unit of the Dental School, University of Nijmegen. She embarked to work on this thesis in 1997. At present, F. K. Kahabuka is a lecturer at the Faculty of Dentistry, Muhimbili University College of Health Sciences. She is married, and has three daughters.

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# QUESTIONNAIRE

# DENTAL TRAUMAS

This questionnaire is divided in two parts. Part I consists of questions about frequency of occurrence and about treatment of dental traumas. Part II consists of questions about opinions on this treatment.

PART I: QUESTIONS ABOUT FREQUENCY OF OCCURENCE AND TREATMENT OF DENTAL TRAUMAS

Instructions: In this part, there are three questions A, B and C to be answered for each of twenty- two traumatic injuries. Put a cross in the box corresponding to your answer; you may put more than one cross, if applicable.

QUESTION A (Initial treatment)

What initial treatment did you give to patients with traumatic injuries aged 0- 17 years during the years 1995 and 1996? In case you provided treatment to a certain type of injury which is not included in the list, please write it in the open space under the answer- boxes of that specific injury.

Note: Unless stated otherwise, the questions refer to both deciduous and permanent dentition.
Abbrevations have been used while writing treatment choices. Please read them as:

| | | |
|---|---|---|
| Reattach. fragment | as | Reattachment of fractured fragment |
| Build up with comp. | as | Build up with composite |
| Build up with GIC | as | Build up with Glass Ionomer Cement |
| Root Canal Rx | as | Root canal treatment |

QUESTION B (# visits/ pt)

On average how many visits per patient are necessary to complete treatment of each of these twenty- two traumatic injuries?

QUESTION C (# pts/ yr)

On average how many patients with each of these twenty- two traumatic injuries did you see per year?

PART II: QUESTIONS ABOUT OPINIONS ON TREATMENT OF DENTAL TRAUMAS

Part I

| | A: initial treatment (more answers possible) | | | | | | | | | | | | | | | | | B: # visits/pt | | | | C: # pts/yr | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No experience | Observation | Selective grinding | Restoration, fragment | Build-up with comp. | Build-up with GIC | Pulp capping | Pulp amputation | Root Canal Rx | Extraction | Re-positioning tooth | Re-planting tooth | Flexible splinting | Rigid splinting | Prosthesis | Cleaning | Suturing | Antibiotics | Refer | 1 | 2 | 3 | ≥4 | 0 | 1 to 5 | 6 to 20 | ≥21 |
| 1 | *Enamel infraction*: an incomplete fracture(crack) involving the enamel without loss of tooth substance | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | *Enamel fracture*: a fracture of the enamel with loss of tooth substance not involving the dentine | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | *Uncomplicated enamel dentine fracture*: a fracture involving the enamel and dentine, but not exposing the pulp | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4 | *Complicated enamel dentine fracture*: a fracture involving the enamel and dentine, exposing the pulp | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5 | *Crown root fracture of deciduous teeth*: a fracture involving enamel, dentine, and cementum, exposing the pulp | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6 | *Uncomplicated crown root fracture of permanent teeth*: a fracture involving enamel, dentine and cementum, exposing the pulp | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7 | *Complicated crown root fracture of permanent teeth*: a fracture involving enamel, dentine and cementum, exposing the pulp | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8 | *Root fracture of deciduous teeth*: a fracture involving the cementum, dentine and pulp; the fracture line is in the coronal half of the root length | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9 | *Horizontal root fracture in the apical half of permanent teeth*: a fracture involving the cementum, dentine and pulp; the fracture line is in the apical half of the root length | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10 | *Horizontal root fracture in the coronal half of permanent teeth*: a fracture involving the cementum, dentine and pulp; the fracture line is in the coronal half of the root length | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11 | *Concussion*: an injury to the tooth-supporting structures without abnormal loosening or displacement of the tooth (but with marked reaction to percussion) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| | A: Initial treatment (more answers possible) | | | | | | | | | | | | | | | | | | B: # visits/pt | | | | C: # days/yr | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No experience | Observation | Selective grinding | Restauration Treatment | Build up with comp. | Build up with GIC | Pulp capping | Pulp amputation | Root Canal Rx | Extraction | Re-positioning tooth | Re-planting tooth | Flexible splinting | Rigid splinting | Prosthesis | Cleaning | Stitching | Antibiotics | Refer | 1 | 2 | 3 | 3+ | 0 | 1 to 5 | 6 to 10 | 10+ |
| 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

12 *Sub-luxation (loosening):* an injury to the tooth-supporting structures with abnormal loosening but without displacement of the tooth (the difference from concussion is the degree of mobility)

13 *Lateral luxation of deciduous teeth:* a displacement of the tooth in a direction other than axially, alveolar fracture may be present

14 *Lateral luxation of permanent teeth:* a displacement of the tooth in a direction other than axially, alveolar fracture may be present

15 *Intrusive luxation of deciduous teeth:* an axial displacement of the tooth into the alveolar socket

16 *Intrusive luxation of permanent teeth:* an axial displacement of the tooth into the alveolar socket

17 *Extrusive luxation of deciduous teeth:* an axial displacement of the tooth out of the alveolar socket

18 *Extrusive luxation of permanent teeth:* an axial displacement of the tooth out of the alveolar socket

19 *Avulsion (exarticulation) of deciduous teeth:* a complete displacement of the tooth out of the alveolar socket

20 *Avulsion (exarticulation) of permanent teeth:* a complete displacement of the tooth out of the alveolar socket

21 *Alveolar fracture:* fracture of the alveolus process without any injury to the teeth or supporting structures

22 *Soft tissue injuries:* injury to the soft tissues e.g. lips, cheeks and tongue without any injury to the teeth or supporting structures

## PART II: QUESTIONS ABOUT OPINIONS ON TREATMENT OF DENTAL TRAUMAS

Instructions: put a cross in the box corresponding to your answer.

**23** How would you rate your education to treat dental traumas?
☐ Very good ☐ Good ☐ Satisfactory ☐ Poor

**24** In general, when do patients with dental trauma come at your clinic for dental consultation?
☐ Immediately ☐ Intermediary ☐ Late ☐ Too late

**25** In your opinion, what is patients' compliance to instructions given following dental trauma?
☐ Very good ☐ Good ☐ Satisfactory ☐ Poor

**26** Do dental trauma patients come back for follow-up visits at your clinic?
☐ Always ☐ Often ☐ Sometimes ☐ Never

**27** What is the situation of equipments for treating dental trauma patients at your clinic?
☐ Very good ☐ Good ☐ Satisfactory ☐ Poor

**28** What is the situation of dental materials for treating dental trauma patients at your clinic?
☐ Very good ☐ Good ☐ Satisfactory ☐ Poor

**29** Is there enough manpower to treat dental trauma patients at your clinic?
☐ Entirely ☐ Just enough ☐ Average ☐ Not quite

**30** Which preventive measure(s) of dental traumas do you practice? (You may choose more than one answer)

☐ Education to parents, teachers and schoolchildren
☐ Advocate the use of mouth-guards during organised sports
☐ Advocate the use of integral motor helmets
☐ Advocate the use of car seat belts
☐ Early orthodontic intervention
☐ Others; please specify: ...

REMARKS:

(Your opinion or comments on this questionnaire are highly appreciated)

Thank you very much for filling in the questionnaire. Please, use the enclosed pre-stamped return envelope to send back the questionnaire.

# Rating of initial treatment options for traumatic dental injuries into correct, unnecessary and wrong

Febronia Kokulengya Kahabuka and Werner Willemsen

## 1.0 Introduction

Successful management of traumatic dental injuries is likely when a patient attends a dental clinic immediately after injury (1). This success will also depend on dedication, knowledge and skills of a dental practitioner (2). In view of these facts, the authors investigated the nature of initial treatment provided by dental practitioners in Tanzania (3). Initial treatment was defined as the treatment provided at the first visit. Questionnaire forms (Appendix 1) were mailed to dental practitioners. The practitioners were requested to indicate on the questionnaire forms the initial treatment they usually provide to 22 types of oral-facial injuries. Nineteen treatment choices were provided and practitioners could choose more than one treatment when applicable. The treatment choices provided on the questionnaire are listed, (Appendix 1). They include; observation, selective grinding, reattachment of a fractured tooth fragment and buildup with composite or buildup with glass ionomer cement. Other choices were; pulp capping, pulp amputation, root canal treatment, extraction, repositioning the tooth and replanting the tooth. Others were, flexible splinting, rigid splinting, prosthesis, cleaning, stitching, antibiotics and refer. The 22 types of injuries are listed in the due course. Unless stated otherwise, the injury is for both deciduous and permanent dentition.

In order to evaluate the treatments reported by Tanzanian dental practitioners, the authors used a rating matrix. The matrix was prepared by employing the treatment recommended in Western countries (1, 4-21). Preparation of the matrix involved rating of the treatment options for each type of injury as correct (treatment that has to be done at first visit), unnecessary (treatment that should not necessarily be done at first visit but may be necessary at follow-up visits or in case of complications) and wrong (treatment that should not be done). The treatment alternative refer was considered correct throughout. When the matrix was applied to Tanzanian dental practitioners, equal proportions of the practitioners, about one third each, reported correct, unnecessary and wrong treatment options (3). These observations were perceived to be unsatisfactory. Thus, the authors predict that in the near future, a number of scientists doing research on oral trauma may increase, if Andreasen s assumption (22) becomes true. In his assumption, Andreasen stated that; dental trauma within the

foreseeable future will probably exceed dental caries and periodontal diseases as the most significant threat to dental health among youth and will be accompanied by significant economic consequences . In order to match with the anticipated changes in the pattern of oral diseases, substantial innovative work in the area of oral trauma will be required.

The aim of this paper is to present the details of the rating matrix. For each type of injury, a definition is given, followed by recommended treatment in literature and the rating matrix into correct, unnecessary & wrong. Whenever according to the matrix proposed correct treatment differs from recommended treatment, a comment section is included to elaborate the choice. Correct and unnecessary treatments are listed while those rated wrong are referred to as all the rest .

## 2.0 The rating matrix

A: Treatment matrix for injuries to tooth hard dental structures (table 1)

### 2.1 Enamel infraction

2.1.2 Definition: an incomplete fracture (crack) involving the enamel without loss of tooth substance.

2.1.3 Recommended treatment: Enamel infractions do not require treatment. However, in case of multiple infraction lines, sealing of the enamel surface may be indicated (Andreasen 1994, McTigue 1994).

2.1.4 Rating matrix :

| | |
|---|---|
| Correct treatment: | Observation |
| Unnecessary treatment: | None |
| Wrong treatment: | All the rest. |
| Comment: | Sealing of enamel surface was not included in the treatment choices |

### 2.2 Enamel fracture

2.2.1 Definition: a fracture of the enamel with loss of tooth substance not involving the dentine.

2.2.2 Recommended treatment: In most cases of enamel fracture, selective grinding of the injured part is sufficient. Sometimes restoration with tooth coloured materials may be inevitable depending on the extent of injury (Andreasen 1985, Andreasen 1994,).

2.2.2 Rating matrix:

| | |
|---|---|
| Correct treatment: | Observation, and selective grinding. |
| Unnecessary treatment: | Reattachment of fragment, build up with composite and build up with Glass Ionomer Cement. |
| Wrong treatment: | All the rest. |

2.3 Enamel-dentine fracture without pulp exposure (uncomplicated enamel-dentine fracture)

2.3.1 Definition: A tooth fracture involving the enamel and dentine, but not exposing the pulp

2.3.2 Recommended treatment: The fundamental treatment goal in this type of fracture is to seal dentinal tubules from bacterial contamination. Second is to restore aesthetics. All exposed dentine should be covered with Calcium Hydroxide paste, Glass Ionomer Cement or with an acid-etch composite resin technique. Immediate reattachment of the crown fragment is normally to be preferred over a temporary crown (Andreasen 1994, McTigue 1994).

2.3.4 Rating matrix:

| | |
|---|---|
| Correct treatment: | Reattachment of a fractured tooth fragment, build up with composite and build up with Glass Ionomer Cement. |
| Unnecessary treatment: | None. |
| Wrong treatment: | All the rest. |

2.4 Enamel-dentine fracture with pulp exposure (complicated enamel-dentine fracture):

2.4.1 Definition: a fracture involving the enamel and dentine, exposing the pulp

2.4.2 Recommended treatment: The objective of treating these fractures is to maintain the pulpal vitality if possible. This allows complete root development to take place if the injured teeth have open apices. In small exposures (1mm) attended within 24 hours from the time of injury, pulp capping is the treatment of choice. Whereas, when the exposure of the pulp is more than 1mm or the patient is attended later than 24 hours from the time of injury, the treatment of choice is pulp amputation. These are followed by composite build-up or reattachment of a fractured fragment (Andreasen 1994, Andreasen 1985, Andreasen & Rindum 1986, Holan 1996).

2.4.3 Rating matrix:

| | |
|---|---|
| Correct treatment: | Pulp capping, pulp amputation, reattachment of fragment, and build up with composite or with Glass Ionomer Cement. |
| Unnecessary treatment: | Root canal treatment and extraction |
| Wrong treatment: | All the rest. |

2.5 Crown root fracture of deciduous teeth:

2.5.1 Definition: a fracture of a deciduous tooth involving the enamel, dentine and cementum, exposing the pulp

2.5.2 Recommended treatment: Extraction is the treatment of choice (Andreasen 1994).

2.5.2 Rating matrix:

| | |
|---|---|
| Correct treatment: | Extraction |
| Unnecessary treatment: | None |
| Wrong treatment: | All the rest. |

2.6 Uncomplicated crown root fracture of permanent teeth:

2.6.1 Definition: a fracture of a permanent tooth involving the enamel, dentine and cementum, not exposing the pulp

2.6.2 Recommended treatment: Removal of coronal fragment and supra gingival restoration is indicated in superficial fractures that do not involve the pulp. Restoration of the tooth with composite resin when gingival healing has occurred (Andreasen 1994).

2.6.2 Rating matrix :

| | |
|---|---|
| Correct treatment: | Reattachment of a fractured tooth fragment, build up with composite and build up with Glass Ionomer Cement. |
| Unnecessary treatment: | None |
| Wrong treatment: | All the rest. |
| Comment: | Reattachment is considered as correct treatment as explained under section 2.3.2 |

2.7 Complicated crown root fracture of permanent teeth:

2.7.1 Definition: a fracture of a permanent tooth involving the enamel, dentine and cementum, exposing the pulp

2.7.2 Recommended treatment: Surgical exposure of fracture surface and orthodontic extrusion of apical fragment followed by restoration/crown is indicated in teeth where the coronal fragment comprises one third or less of

the clinical root. Surgical extrusion of apical fragment is indicated in teeth where the coronal fragment comprises less than half root length. The tooth is then restored temporarily, splinted to neighbouring teeth for 6 months after which definite restoration is done (Andreasen 1994). The fracture line in crown root fractures is usually oblique and difficult to treat. They have poor prognosis if a conservative approach is chosen. Often the best alternative is to extract the involved tooth (teeth) and prepare a prosthesis (Andreasen 1994,). Extraction is indicated in teeth where the coronal fragment comprises more than one third of the clinical root and in case of fractures following the long axis of the tooth.

2.7.2 Rating matrix:

| | |
|---|---|
| Correct treatment: | Reattachment of a fractured tooth fragment, build up with composite, build up with Glass Ionomer Cement, root canal treatment and extraction. |
| Unnecessary treatment: | None. |
| Wrong treatment: | All the rest. |

2.8 Root fracture of deciduous teeth:

2.8.1: Definition: a fracture of a deciduous tooth involving the cementum, dentine and pulp; the fracture line is in the coronal half of the root length

2.8.2 Recommended treatment: Fractures in the middle or cervical third of the root are indicated for extraction. Most teeth with fractures that occur in the apical third of the root maintain their vitality. These teeth should be monitored periodically (Andreasen 1994). Spontaneous healing may occur despite mobility at the fracture line. If infection occurs, only the coronal fragment is extracted. The apical part can be left to resorb physiologically

2.8.3. Rating matrix:

| | |
|---|---|
| Correct treatment: | Observation |
| Unnecessary treatment: | Extraction, flexible and rigid splinting. |
| Wrong treatment: | All the rest. |

2.9 Horizontal root fracture in the apical half of permanent teeth:

2.9.1: Definition: a fracture of a permanent tooth involving the cementum, dentine and pulp; the fracture line is in the apical half of the root length

2.9.2. Recommended treatment: Repositioning the coronal portion of the tooth fragment (if it is displaced) and applying a firm immobilization with a splint for 2 to 3 months. Root canal treatment initiated when clinical and

radiographic signs of necrosis or resorption are apparent (Andreasen 1994,).

2.9.3. Rating matrix:

| | |
|---|---|
| Correct treatment: | Rigid splinting and repositioning the tooth. |
| Unnecessary treatment: | Root canal treatment and extraction |
| W rong treatment: | All the rest. |

2.10 Horizontal root fracture in the coronal half of permanent teeth:

2.10.1 Definition: a fracture of a permanent tooth involving the cementum, dentine and pulp; the fracture line is in the coronal half of the root length

2.10.2 Recommended treatment: The aim is to strive for a vital pulp. Therefore, the treatment of choice consists of repositioning of the fractured segment followed by immobilization of the involved tooth or teeth for 2 to 3 months with a rigid splint. Proper treatment is associated with chances of healing through callus formation or interposition of periodontal ligament (Andreasen 1971, Andreasen & Andreasen 1988, Andreasen, Andreasen & Bayer 1988, Andreasen 1989). In the meantime, the tooth is observed for any signs of pulp necrosis; if this occurs, it is mostly in the coronal part, which should then be, treated endodontically (Andreasen 1971, Andreasen 1989). If the fracture is located very close to the gingiva, extraction of the coronal fragment may be indicated, followed by orthodontic or surgical extrusion (Andreasen 1994).

2.10.2 Rating matrix :

| | |
|---|---|
| Correct treatment: | Rigid splinting and repositioning the tooth. |
| Unnecessary treatment: | Root canal treatment and extraction. |
| W rong treatment: | All the rest. |

B: Treatment matrix for injuries to tooth supporting structures, the alveolus and soft tissue injuries (table 2)

2.11 Concussion:

2.11.1 Definition: an injury to the tooth supporting structures without abnormal loosening or displacement of the tooth (but with marked reaction to percussion)

2.11.2 Recommended treatment: Basically, no treatment is required. What may appear necessary are occlussal relief and a soft diet for 14 days for patient s comfort. The chance of pulp involvement in this type of injury is minimal; although the prognosis is normally good, follow-up is essential due to possible risk of pulp necrosis (Andreasen 1994).

2.11.2. Rating matrix:

| | |
|---|---|
| Correct treatment: | Observation. |
| Unnecessary treatment: | None. |
| Wrong treatment: | All the rest. |

2.12 Sub-luxation (loosening):

2.12.1 Definition: an injury to the tooth-supporting structures with abnormal loosening but without displacement of the tooth (the difference from concussion is the presence of mobility)

2.12.2 Recommended treatment: Basically, no treatment is required. What may appear necessary are occlussal relief and a soft diet for 14 days for patient's comfort. The chance of pulp involvement in this type of injury is minimal; nevertheless, follow-up is essential due to possible risk of pulp necrosis. Splinting sub-luxated teeth should be avoided. Observation at follow-up visits and root canal treatment to be instituted at the first sign of pathological change (Andreasen 1994).

2.12.3 Rating matrix :

| | |
|---|---|
| Correct treatment: | Observation. |
| Unnecessary treatment: | Flexible splinting, Root canal treatment and antibiotics |
| Wrong treatment: | All the rest. |

2.13 Lateral luxation of deciduous teeth:

2.13.1 Definition: a displacement of a deciduous tooth in a direction other than axially, alveolar fracture may be present

2.13.2 Recommended treatment: Generally, the teeth should be allowed to readjust spontaneously. Unless occlusion dictates otherwise, a laterally luxated incisor can be left untreated. In rare instances when the laterally luxated tooth is displaced with the apex forced into the follicle, it is then indicated for extraction. When alveolar fracture is present, treatment involves repositioning of the fragment and application of a flexible splint for 2-4 weeks. In case of an apical lock, first the fragment is slightly extruded to free the apices and then repositioned. Root canal treatment may be done during the splinting period (Andreasen 1994).

2.13.2 Rating matrix :

| | |
|---|---|
| Correct treatment: | Observation. |
| Unnecessary treatment: | Extraction, flexible splinting and antibiotics. |
| Wrong treatment: | All the rest |
| Comment: | Root canal treatment? |

2.14 Lateral luxation of permanent teeth

2.14.1 Definition: a displacement of a permanent tooth in a direction other than axially, alveolar fracture may be present

2.14.2 Recommended treatment: In teeth with open apices, repositioning the tooth and alveolar bone fragment, a flexible splint for 3 weeks, systemic antibiotics for 3 weeks and chlorhexidine mouth rinse. In case of necrosis, root canal treatment should be done. In teeth with closed apices, repositioning the tooth, application of a flexible splint and root canal treatment soon after the teeth are splinted because in such teeth, pulps will likely become necrotic (Andreasen 1994, McTigue 1994).

2.14.2 Rating matrix:

| | |
|---|---|
| Correct treatment: | Repositioning the tooth and flexible splinting. |
| Unnecessary treatment: | Root canal treatment, extraction and antibiotics |
| Wrong treatment: | All the rest. |

2.15 Intrusive luxation of deciduous teeth:

2.15.1 Definition: an axial displacement of a deciduous tooth into the alveolar socket

2.15.2 Recommended treatment: If the intruded incisor is contacting the permanent tooth bud the primary tooth should be extracted. The root of primary incisors are titled labially. For this reason, most roots of intruded primary incisors will be forced through the labial bone plate. This direction of displacement may be confirmed by foreshortening of the intruded incisor in an occlussal radiographic exposure. In such cases, spontaneous re-eruption should be anticipated. Follow-up is essential, and if a fistula or a periapical radiolucency occurs the tooth is then indicated for extraction (Andreasen 1994, McTigue 1994). Whereas, when the primary incisor root is displaced into the follicle zone (only in a few cases), extraction of the involved tooth is inevitable. This direction of displacement may be confirmed by an elongated radiographic image.

2.15.3 Rating matrix:

| | |
|---|---|
| Correct treatment: | Observation |
| Unnecessary treatment: | Root canal treatment, extraction, repositioning the tooth, flexible splinting and antibiotics. |
| Wrong: | All the rest |

2.16 Intrusive luxation of permanent teeth:

2.16.1 Definition: an axial displacement of a permanent tooth into the alveolar socket

2.16.2 Recommended treatment: The treatment of choice is to reposition the intruded tooth by forceps or orthodontically, using light forces. The pulp should be extirpated within one week following the injury and followed by endodontic treatment (Andreasen 1994, McTigue 1994). Like in the case of extrusion and lateral luxation, the treatment of intruded teeth depends on the stage of root development. When a tooth with immature root formation is intruded, it is rational to await spontaneous eruption. Signs of spontaneous eruption may be seen 1,5 weeks following trauma, but must occur within one to one and a half months, otherwise orthodontic extrusion is advocated. After repositioning an intruded tooth, the chances of revascularization are minimal even in teeth with open apices; therefore, it is necessary to make radiographs at each follow-up visit to monitor pulp condition. Should pulp necrosis occur, root canal treatment is done. Teeth with fully developed apices have a higher risk of developing pulp necrosis (Andreasen 1986, Andreasen Zhinje & Thomsen 1986, Feiglin 1996). When such a tooth is intruded but with part of the crown visible in the oral cavity, it is advisable to do root canal treatment as soon as possible and postpone repositioning. If no part of the crown is visible in the oral cavity, the tooth should be extruded to its original position, and a flexible splint applied, followed by root canal treatment immediately or just before removing the splint.

2.16.2 Rating matrix :

| | |
|---|---|
| Correct treatment: | Root canal treatment. |
| Unnecessary treatment: | Extraction, repositioning the tooth & flexible splinting, and antibiotics |
| Wrong treatment: | All the rest. |

2.17 Extrusive luxation of deciduous teeth:

2.17.1 Definition: an axial displacement of a deciduous tooth out of the alveolar socket

2.17.2 Recommended treatment: Extraction is usually the treatment of choice. Otherwise, splinting the teeth with sutures until periodontal ligament attachment occurs, approximately after 2 weeks is recommended (Andreasen 1994).

2.17.2 Rating matrix:

| | |
|---|---|
| Correct treatment: | Observation and extraction |
| Unnecessary treatment: | Flexible splinting and antibiotics |
| Wrong treatment: | All the rest. |
| Comments: | Splinting? |

2.18 Extrusive luxation of permanent teeth:

2.18.1 Definition an axial displacement of a permanent tooth out of the alveolar socket

2.18.2 Recommended treatment: The mode of treatment depend on the stage of root development. In teeth with open apices, there is a chance of revascularization of the pulp. Therefore, treatment involves repositioning the tooth, applying a flexible splint (Macko 1977) and observing the tooth for pulp conditions at follow-up visits (Andreasen 1986, Andreasen Zhinje & Thomsen 1986, Oikarinen 1987, Andreasen 1994). Teeth with fully developed apices have a high risk of developing pulp necrosis. The treatment of choice is thus to reposition the tooth, apply a flexible splint and do root canal treatment just before removing the splint.

2.18.2 Rating matrix :

| | |
|---|---|
| Correct treatment: | Repositioning the tooth and flexible splintirg. |
| Unnecessary treatment: | Root canal treatment, extraction and antibiotics |
| W rong treatment: | All the rest. |

2.19 Avulsion (exarticulation) of deciduous teeth:

2.19.2 Definition: a complete displacement of a deciduous tooth out of the alveolar socket

2.19.2 Recommended treatment: Avulsed deciduous teeth should not be replanted due to frequent chances of pulp necrosis and risk of further injury to the permanent tooth germ by the re plantation procedure. (Andreasen 1994, Ellis 1970).

2.19.3 Rating matrix :

| | |
|---|---|
| Correct treatment: | Observation |
| Unnecessary treatment: | Cleaning and prescription of antibiotics. |
| W rong treatment: | All the rest. |

2.20 Avulsion (exarticulation) of permanent teeth:

2.20.1 Definition: a complete displacement of a permanent tooth out of the alveolar socket

2.20.2 Recommended treatment: When the avulsed teeth have immature apices, they should be replanted and a flexible splint applied for approximately two weeks. The tooth is observed for pulp condition at follow-up visits, in case pulp necrosis occurs, root canal treatment is done (Andreasen 1971). In teeth with fully developed apices it is wise to do endodontic treatment just before removing the splint (Andreasen 1994,). After replantation, it is of

utmost importance for the patient to maintain good oral hygiene. This can be supplemented by chlorhexidine mouthwash. Successful periodontal healing of the avulsed tooth depend on storage conditions and the length of extra-oral period (Andreasen 1971, Andreasen 1966, Oikarinen & Gundlah 1987, Anderson & Bodin 1989, Andreasen 1980, American Ass of Endo 1995). Prescription of antibiotics is recommended by Andreasen (1994).

2.20.3 Rating matrix:

| | |
|---|---|
| Correct treatment: | Replanting the tooth and flexible splinting |
| Unnecessary treatment: | Root canal treatment, prosthesis, cleaning, stitching and prescription of antibiotics. |
| Wrong treatment: | All the rest. |
| Comment: | No real evidence that healing is better when antibiotics are used. Antibiotics should therefore be used when there are systemic complications or in case of medically compromised patients. |

2.21 Alveolar fracture:

2.21.1 Definition: fracture of the alveolar process without any injury to the teeth or supporting structures

2.21.2 Recommended treatment: Repositioning the displaced fragments. Application of a rigid fixation, that is, orthodontic band/resin splint, acid-etch/resin splint for 2 to 6 weeks (Andreasen 1994). Treatment of the fracture of alveolus does not differ much from that of lateral luxation because in most instances these two fractures occur together.

2.21.3 Rating matrix :

| | |
|---|---|
| Correct treatment: | Rigid splinting |
| Unnecessary treatment: | Cleaning, stitching and prescription of antibiotics. |
| Wrong treatment: | All the rest. |

2.22 Soft tissue injuries:

2.22.1 Definition: injury to the soft tissues e.g. lips, cheeks and tongue without any injury to the teeth or supporting structures.

2.22.2 Recommended treatment in literature: Cleansing of the wound with saline and inspection for foreign bodies. In case of deep wounds, repositioning of

the tissues and stitching accordingly and prescription of chlorhexidine for 4 to 5 days. Prophylactic use of antibiotics in soft tissue wounds have been recommended by Andreasen (Andreasen 1994) in the following situations; when the wound is heavily contaminated and wound debridement is not optimal or when wound debridement has been delayed. Other situations are when open reduction of jaw fractures is part of the treatment, when the general defense system of the patient is compromised, or in case of human or animal bite wounds.

2.22.3 Rating matrix :

| | |
|---|---|
| Correct treatment: | Cleaning and stitching |
| Unnecessary treatment: | Prescription of antibiotics. |
| Wrong treatment: | All the rest. |
| Comment: | No real evidence that healing is better when antibiotics are used. Antibiotics should therefore be used when there are systemic complications or in case of medically compromised patients. |

Discussion

Dental trauma patients visit dental clinicians unexpectedly; therefore each dental clinician needs to have at hand, the correct knowledge on initial treatment to be given for various injuries. This could be accomplished through continuing education causes or seminars, (in a series of investigations we conducted in Tanzania on the management of dental trauma (manuscript in preparation), seminars proved to better improve school teachers knowledge compared to mailed instructions). Continuing education causes should preferably be preceded by investigation of the initial treatment being provided by the dental clinicians. Whenever such an investigation is done, we recommend that the current rating system be adopted. The rating may be applied as presented in this manual when studies are done in Western countries since it was prepared basing on treatment recommended in these countries. Otherwise, application of the rating system may warrant some modifications so as to suit a given situation.

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Table 1: Treatment matrix for injuries to tooth hard dental structures

| Injury | Observation | Selective grinding | Reattachment of fractured tooth fragment | Build up with composite | Buildup with Glass Ionomer Cement | Pulp capping | Pulp amputation | Root canal treatment | Extraction | Flexible splinting | Rigid splinting | Repositioning the tooth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Enamel infarction | C | | | | | | | | | | | |
| Enamel fracture | C | C | U | U | U | | | | | | | |
| Enamel-dentine fracture without pulp exposure | | | C | C | C | | | | | | | |
| Enamel-dentine fracture with pulp exposure | | | C | C | C | C | C | U | U | | | |
| Crown root fracture of deciduous teeth | | | | | | | | | C | | | |
| Uncomplicated crown root fracture of permanent teeth | | | C | C | C | | | | | | | |
| Complicated crown root fracture of permanent teeth | | | C | C | C | | | C | C | | | |
| Root fracture of deciduous teeth | C | | | | | | | | U | U | U | |
| Horizontal root fracture in the apical half of permanent teeth | | | | | | | | U | | | C | C |
| Horizontal root fracture in the coronal half of permanent teeth | | | | | | | | U | U | | C | C |

Key:

C = Correct. U = Unnecessary, Blank = Wrong

Table 2: Treatment matrix for injuries to tooth supporting structures, the alveolus and soft tissue injuries

| Injury | Observation | Repositioning the tooth | Replanting the tooth | Flexible splinting | Rigid splinting | Prosthesis | Cleaning | Stitching | Antibiotics | Root canal treatment | Extraction |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Concussion | C | | | | | | | | | | |
| Subluxation | C | | | U | | | | | U | U | |
| Lateral luxation of deciduous teeth | C | | | U | | | | | U | | U |
| Lateral luxation of permanent teeth | | C | | C | | | | | U | U | U |
| Intrusive luxation of deciduous teeth | C | U | | U | | | | | U | U | U |
| Intrusive luxation of permanent teeth | | U | | U | | | | | U | C | U |
| Extrusive luxation of deciduous teeth | C | | | U | | | | | U | | C |
| Extrusive luxation of permanent teeth | | C | | C | | | | | U | U | U |
| Avulsion of deciduous teeth | C | | | | | | U | | U | | |
| Avulsion of permanent teeth | | | C | C | | U | U | U | U | U | |
| Alveolar fracture | | | | | C | | U | U | U | | |
| Soft tissue injuries | | | | | | | C | C | U | | |

Key:

C = Correct. U = Unnecessary, Blank = Wrong

# Appendix Chpt.7

## Oral trauma
## guidelines for school teachers

### Introduction

Children are very active in organised and unorganised sports. In so doing they sustain various injuries. The injuries that occur in the oral region especially those involving the teeth need to be attended by a dental practitioner as soon as possible after the injury. Delay in seeking dental treatment may decrease the chance for success of treatment. Find below, a guide on what to do in case a child sustains injury to the oral tissues or the teeth.

### All oral and tooth injuries

Send the child to a nearby dental clinic as soon as possible

In case of a knocked out tooth (avulsion), give first aid before sending the child to a dentist:

1. Put the tooth back to the socket it came from (if it is clear how to place it back).
2. If the tooth has fallen on the ground and is covered with dirt, clean it preferably with saline. If saline is not available, wash it with a stream of running water. Do not scrub to remove dirt.
3. If you can not put the tooth back to its socket, keep it in a clean container with saline or milk if available, on a way to the dental clinic. (Pure water is not a good medium).
4. Do not replant a knocked out milk tooth, instead, keep it in a clean container with saline or milk if available, on a way to the dental clinic.

In case of a fractured tooth:

1. If a fractured tooth fragment is available, keep it and take it with the child to a dentist either dry or wet (in the same way as described above).

# Kuumia Kinywani
# Mwogozo kwa walimu

## Utangulizi

Kwa kawaida, watoto hushiriki katika michezo mbalimbali. Wakati wa michezo, badhi ya watoto hupata majeraha au huumia kwa bahati mbaya. Majeraha yanayotokea sehemu ya kinywa na meno, inabidi yapatiwe huduma na Daktari wa meno mapema iwezekanvyo.

Kuchelewa  kupata huduma, kunaweza kusababbisha uwezekano wa kutopona vizuri hata baada ya matibabu.

Yafuatayo ni maelekezo ya mambo ya kufanya itokeapo mtoto akaumia sehemu za kinywa na meno.

## Kwa majeraha yote ya sehemu ya kinywana meno:

Mpeleke mtoto kwa Daktari wa meno aliye karibu, haraka iwezekanavyo.

## Jino liking' oka:

Kabla ya kumpeleka mtoto kwa Daktari wa meno, kwanza mpatie huduma ifuatayo;

Kama jino limeanguka chini (likachafuka), lioshe kwa kulimiminia maji ya chumvichumvi kama yapo, au maji yoyote safi. Usilisugue kuondoa uchafu.

Lirudishe jino kwenye soketi (mahali lilipong oka) iwapo unaweza kufanya hivyo.

Kama huwezi kulirudisha jino kwenye soketi (lilipong oka), liweke kwenye chombo kisafi chenye maji ya chumvichumvi au maziwa freshi kama yanapatikana.

Mpeleke mtoto pamoja na jino kwa Daktari wa meno haraka iwezekanavyo.

Kama jino lililong oka ni la maziwa (la utoto), usilirudishe kwenye soketi. Badala yake litunze kwenye chombo kisafi chenye maji ya chumvichumvi au maziwa freshi na mpeleke mtoto pamoja na jino kwa Daktari wa meno haraka iwezekanavyo.

## Jino likivunjika au kumegeka

Kama kipande kilichovunjika au kumegeka kipo, kihifadhi na kukipeleka pamoja na mtoto kwa Daktari wa meno.

Unaweza kufunga kipande hicho cha jino kwenye kipande cha karatasi au kitambaa chenye unyevunyevu au hata kikavu.

UKIVUNJIKA JINO
UNAWEZA KUTIBIWA

UKIVUNJIKA JINO
UNAWEZA KUTIBIWA

# KUUMIA KINYWANI

## Utangulizi

Kwa kawaida watoto hushiriki katika michezo mbalimbali. Wakati wa michezo, baadhi ya watoto hupata majeraha au huumia kwa bahati mbaya. Majeraha yanayotokea sehemu ya kinywa na meno, inabidi yapatiwe huduma na Daktari wa meno mapema iwezekanavyo.

Kuchelewa kupata huduma, kunaweza kusababisha uwezekano wa kutopona vizuri hata baada ya matibabu.

# MWONGOZO KWA WAALIMU

*Yafuatayo ni maelekezo ya nambo ya kufanya ilokeapo mtoto akaumia sehemu za kinywa na meno.*

## KWA MAJERAHA YOTE YA SEHEMU YA KINYWA NA MENO

**Mpeleke mtoto kwa Daktari wa meno aliye karibu haraka iwezekanavyo.**

### JINO LIKING'OKA

Kabla ya kumpeleka mtoto kwa Daktari wa meno, kwanza mpatie huduma ifuatayo:

1. Kama jino limeanguka chini (likachafuka), lioshe kwa kulimiminia maji ya chumvichumvi kama yapo, au maji yoyote safi. Usilisugue kuondoa uchafu.
2. Lirudishe jino kwenye soketi (mahali lilipong'oka) mapo unaweza kufanya hivyo.
3. Kama huwezi kulirudisha kwenye soketi (lilipong'oka), liweke kwenye chombo kisafi chenye maji ya chumvichumvi au maziwa freshi kama yanapatikana. Mpeleke mtoto pamoja na jino kwa Daktari wa meno haraka iwezekanavyo.

### JINO LIKIVUNJIKA AU KUMEGEKA

1. Kama kipande kilichovunjika au kumegeka kipo, kihifadhi na kukipeleka pamoja na mtoto kwa Daktari wa meno.
2. Unaweza kufunga kipande hicho cha jino kwenye kipande cha karatasi au kitambaa chenye unyevunyevu au hata kikavu.